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Electrical World

McGraw-Hill Company, Inc. New York, April 8, 1922 Twenty-five Cents a Copy

"X-ing out the Renewal "X"pense

Is there any sane reason why the central station industry should stand the expenses incident to fuse renewal?

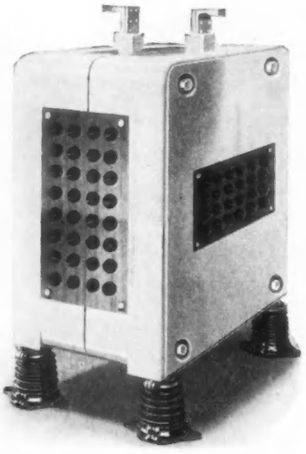
You know the savings you can effect by letting the customer do this. But do you know how Wadsworth meter entrance switches can save all this and still overcome any objections that may be raised about putting this expense where it belongs?

We have the answer. It's yours for the asking.

The Wadsworth Electric Manufacturing Company, Inc., Covington, Ky.

COMPRO Meter Switch

Outdoor service, 25 to 250 Amp.



Indoor service, 25 to 350 Amp.

Short Circuits

in your system cannot be prevented—as yet!

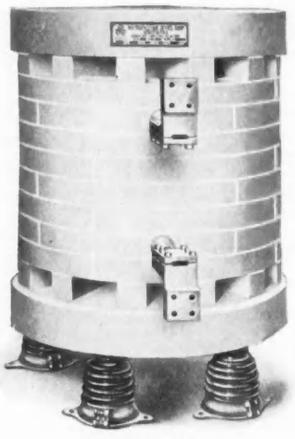
Do the next best thing, protect your equipment from abnormal and dangerous stresses.

Install Metropolitan Current Limiting Reactors

and have

maximum { short circuit protection / reactance / efficiency }

minimum { energy losses / space requirement / temperature rise }

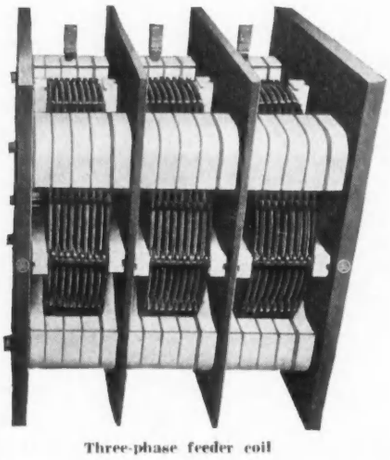


Indoor service, 350 to 750 Amp.

Inddir service, 750 to 3000 Amp.

Metropolitan Device Corporation

1250 Atlantic Avenue
Brooklyn, N. Y.



Three-phase feeder coil

METROPOLITAN DEVICE CORPORATION,
1250 Atlantic Ave., Brooklyn, N. Y.

Gentlemen: Please send data and full information on current-limiting reactors.

Name of Company .....
By ..... Title .....
Address .....
Date .....

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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Our Cliques in Corners

FOUR kinds of electrical men make up the electrical industry. They represent the interests of central stations, manufacturers, jobbers and contractor-dealers. They are organized into groups and as groups they operate. But the electrical industry is bigger than any group.

For the electrical industry is engaged in the development of our greatest natural resource and in rendering a service to the people of America that is vital to their present and to their future. Electrical men have built up a great science and a great art, carried it through successive eras of research, invention and engineering, and now stand just within the threshold of a great commercial era, possessed of a great business. The proper co-ordination of these four functioning groups is necessary to the progress and prosperity of all. The responsibility of each group to the industry and to the people must outweigh all selfish class purposes or considerations.

REPRESENTING these four classes of electrical men we have several associations. These class associations are discussional bodies. Having large membership, they work by committees and the limit of power in committee work is usually to develop information and to determine policies. But to represent all these classes and to receive, co-ordinate, apply and promote these policies to the common purpose and the common interests of the industry as a whole some neutral agency is needed that may provide a working organization capable of carrying out a five or ten-year program. For such a function the Society for Electrical Development was established.

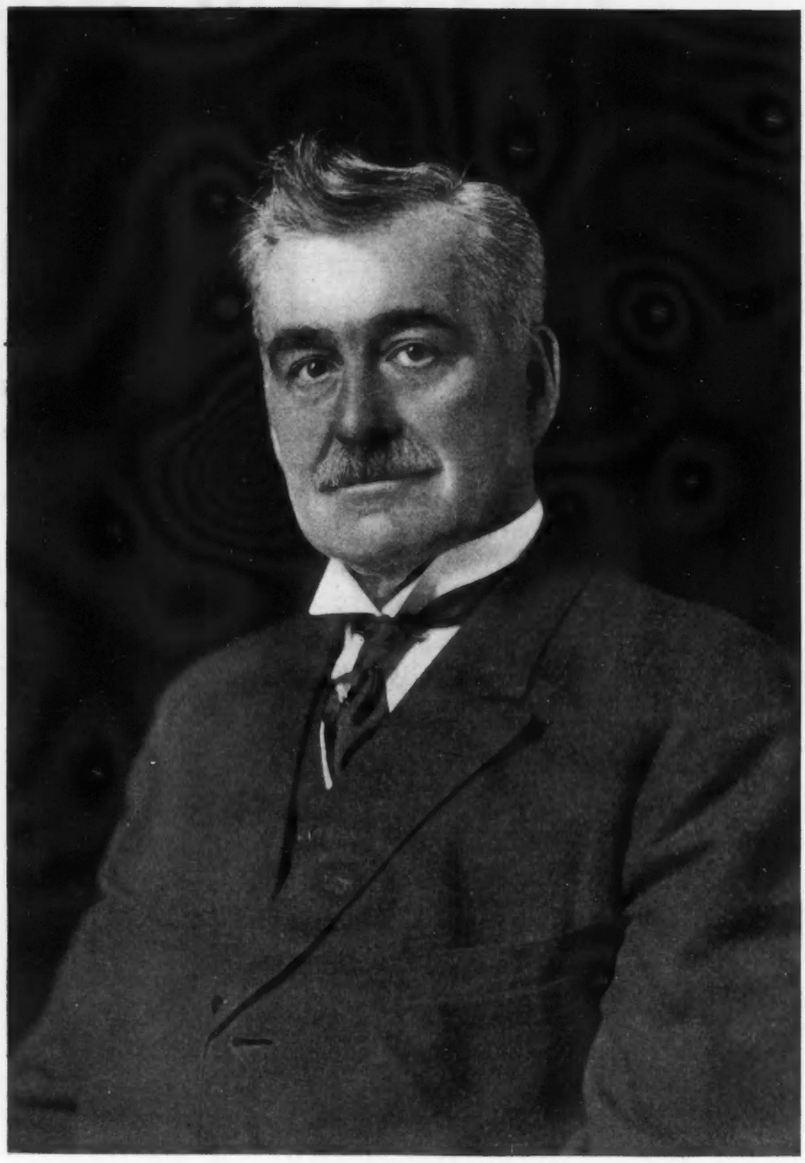
This balanced organization of our industry, however, has never been realized. Each class clique still clusters in its corner, busy about itself and its own class affairs. No single group can ever dominate all. No one class association, however powerful, can successfully assume the authority to speak for all. But to no one is the opportunity given to act for all in the co-ordination and advancement of the common aims.

GOOD times are now returning to America. Tremendous expansion and activity lie ahead for the electrical industry. Never in our history has there been so great a need for a smooth-running, well-functioning organization to carry forward, in honest balance, the plans and purposes of each electrical group for the developing of the common aim and opportunity.

If the Society is not the instrument we need, let us decide it so and cast it out. But we must be prepared to set up something better as a working force to serve all classes of electrical men and to promote this industry progressively.

William Jared Clark

Pioneer in the commercial development of electric railways and physical valuation of utilities



BACK in the eighties when the street cars were hauled by horses it required no small amount of courage to follow the vision of electric traction. Power houses were in their infancy, investment had been made in many places in horse-car systems, and the electric installation was comparatively costly. When, however, the vision had once captivated its beholders it never faded, but grew constantly clearer till it turned into reality. With this realized vision the life of W. J. Clark, recently made advisory manager of the General Electric Company's railway department, has been bound up. Mr. Clark originated the project for the first electric railway in the world intended for freight traffic and was instrumental in obtaining the legislative charter authorizing its construction at the cities of Derby and Ansonia, Conn.

It was upon the advice of the late William Wallace, pioneer in arc lighting and motor production, that Mr. Clark, attracted by the possibilities presented by electric traction, entered the electrical industry in the spring of 1888. He has since participated in the commercial expansion of almost every phase of the Thomson-Houston and General Electric companies' business throughout the world. He has been manager of both the railway and foreign departments and of the Cincinnati and London offices of the General Electric Company, managing director of the British Thomson-Houston Electric Company, and has held several other positions of importance.

One of the first things he did after joining the company was to induce it to purchase the Van Depoele electric railway patents, which from a patent standpoint were essential to the fullest possible development of that industry. He early realized the value of certain fundamental patented electrical inventions and was an active worker in bringing these under the control of the corporate interests he represented. Mr. Clark played an important part in the commercial exploitation not only of the Van Depoele patents but of Potter's series parallel control, Sprague's multiple-unit train control, Curtis' steam turbine and other inventions as well. In 1896 at Milwaukee he made, for the first time in this country, what is now termed the "physical valuation" of a large electric public utility. This work was highly complimented by the United States circuit court under whose scrutiny it came, and the general plan then inaugurated has since been frequently followed by others.

In 1906 and 1907 Mr. Clark was the chairman of the ways and means committee of the National Civic Federation, in which connection he financed the extensive investigation of municipal ownership conducted by the federation in this country and in Europe, and he was as well a member of the commission which made the investigation. In 1908 he acted as an expert on Cuban affairs for the War Department.

Mr. Clark was born in Derby, Conn., in 1854 and prior to entering the electrical field at the age of thirty-four had been engaged in the coal business and as postmaster in his native town. Since 1888 he has devoted his entire time to the electrical industry, with particular attention to the development and progress of electric traction. He is a member of a number of national electrical and railway engineering societies, in the work of which he has been actively interested.

Editorial Comment

Electrical World, April 8, 1922

Volume 79 Number 14

Challenge to Private Enterprise

GOVERNOR MILLER in his memorandum attached to New York's amended water-power act was careful to outline the Empire State's policy with reference to water-power development. Outwardly at least it is the wish and intention of the state to encourage development by private enterprise, and, failing in this, state development is the alternative. The law is patterned largely after the federal water-power act and brings under it all legislative grants to develop water power on which no work has been done. To have and to hold henceforth is taboo. The new order is to have and to develop.

What, then, shall the answer be? An enterprising and far-sighted industry will accept the invitation and thereby make null the threat. Water powers are becoming increasingly valuable, and their development is a social and national necessity. The obligation to develop them is clearly the duty of the electrical industry, and this duty must not be shirked.

Another Case of Mixing Dates

DURING the week of May 15 the National Electric Credit Association will hold its summer convention at Detroit. The National Electric Light Association will be gathered at Atlantic City at the same time. Here is another case of mixing dates of the meetings of large groups of electrical men that should be so arranged that they will not conflict. To this end it was suggested some weeks ago by the ELECTRICAL WORLD that a clearing house be set up to which tentative dates may be referred before conventions are definitely scheduled so that previous datings can be compared and such complications avoided. The Society for Electrical Development has acted on this suggestion and assigned a member of its staff to function in the way proposed.

It is doubtful if any of the central-station executives who will be in Atlantic City would be likely to attend the Detroit meeting, but there are many of the jobbers and manufacturers dated up for the N. E. L. A. convention who should sit in with their credit men and give active thought and personal support to this most important work. And there will be many executives of jobbing and manufacturing houses at Detroit, because they themselves carry the credit functions for their companies, who should be at Atlantic City. They would be welcome. They would contribute a valuable point of view to the discussion of common problems. They would meet many of their central-station customers who will be there.

It is unfortunate that the presence of these men at both conventions should be prevented by the mere fact that in the arranging of the dates the conflict was not avoided. It will probably not be possible to end all parallel meetings, but there will be many cases where a simple, sensible precaution of this kind will enable men interested in two gatherings to attend them both, to their own good profit and the distinct advantage of the conventions. It cannot be repeated too often that we need more contact between the different classes of men in the electrical industry.

Dignified Appeal to Public Opinion

WE CANNOT refrain from expressing admiration for the appeal to the public conscience made by the New York Telephone Company last week. Sensing its obligation to furnish comprehensive telephone service of a high quality to the public and feeling that the rates allowed by the Public Service Commission would mean deterioration as well as stoppage of expansion, the utility for the first time and with reluctance appeals to the courts for relief. It is not our purpose to delve into the merits or demerits of the case. Our interest is in the public announcement made by the company to its patrons. It is dignified, frank and to the point. No earmarks of deception are discernible, and it must impress the average reader favorably. That, after all, is the end sought, and as an example of public utility advertising for establishing good public relations it is most effective and warrants the emulation of other public utilities confronting similar conditions.

Central-Station Companies Contemplating Use of Radio Must Experiment

THE central-station manager who desires to use the radio telephone for operating purposes must be prepared to go into the project on an amateur basis because too many things are involved at the present time to determine with authority whether and in just what way it is practically applicable to the requirements of the central-station company. The reliability of operation, the range of transmission and government regulations are too uncertain for any one to reach definite conclusions yet. Interference, irregularity and discontinuity of reception are just a few of the problems which must be faced. Plenty of apparatus for the construction of radio sets is available, but the exact character of apparatus which will be suitable for commercial application to central stations has not yet been determined. This is largely due to the fact that manufacturers have had to confine themselves to supplying amateur demands. When the present radio fad subsides or becomes stabilized, they will be able to give more attention to the commercial requirements of the central-station field and other would-be customers than is just now possible.

Therefore, we repeat, if central-station companies

desire to adapt radio to their operating requirements, they must play with the apparatus to find its limitations and weaknesses. Some of the problems outside the purely technical features of the work that the experimenter must be prepared to face are told of elsewhere in this issue.

Outdoor Versus Indoor Installations

AN ANALYSIS of the factors that determine the decision to install outdoor or indoor switching and transformer installations in this country today would show, without doubt, that many inconsistencies exist in practice. It is true that in the case of older installations there was no choice to be made, indoor equipment being generally all that was available; but in the last years, with both indoor and outdoor equipment on the market, and both of proved worth, it is evident that nationally a uniform or consistent viewpoint has not been reached. In the most rigorous climates we find sometimes an abundance of outdoor installations, while in many places where the climate seems to lend itself ideally to outdoor installations nearly all transformers and switches are found indoors. Allowance must, of course, be made for diverse opinions among engineers and for prejudices that possibly may come from a long and successful operating career. None the less, an effort to crystallize knowledge and experience into a more uniform policy should be made. A great deal of good could be accomplished by the free exchange of data and comparison of results.

Inconsistency on the part of engineers as a class is not productive of good and is not in keeping with their training or their purpose. Sound analysis of costs and operating conditions would clear away much of the disagreement that exists today. Were it only to present a solid front to the prospective investor in transmission securities and thereby obviate the answering of difficult questions, would it not be well for engineers to get together and formulate a policy regarding outdoor and indoor switching and transformer installations that will be consistent with engineering principles?

Most Economical Utilization of Steam Is Deciding Factor

ENGINEERS, like other people, may be divided into optimists and pessimists. The former cultivate faith in apparatus, the latter deep-rooted distrust. The former are willing to follow Mark Twain's injunction to put all their eggs in one basket and then watch that basket; the latter pack each egg in cotton wool and intrust it to a special conveyance without further care. The optimist builds a station with few but independent units and with a plan of construction as simple as practicable; the pessimist provides for universal interchangeability of everything and is unhappy unless there are at least three automatic contraptions, each watching the one nearest it.

This difference of temperament is apparent in the types of auxiliary drives now attracting so much attention. Beginning with a power house in which everything was independently steam-driven because of a pessimistic frame of mind handed down from the last generation which whispered always that the motor might burn out, we have gradually cheered up until we have almost reached the point of faith where we are ready to drive the auxiliaries straight from the turbo-generators. Those affected with spasms of caution have tried out mixed methods, generally with intermediate results. From our own viewpoint the more direct the drive and the simpler the equipment the less likelihood of trouble—on the whole. Working from the main turbines at a voltage high enough to make distribution easy has much to be said in its favor, for the electrical drive is extremely reliable in these days. In efficiency small reciprocating engines are bad and small turbines possibly worse unless all the exhaust steam is utilized. Even then the over-all plant economy must be carefully analyzed to make certain that what appears to be an economical use of steam is not productive of lower plant economy than could be obtained by a more judicious selection of auxiliary drives.

The great variations of current practice show the many minds in these matters, but on the whole the fashion of extreme complication, based on the plea of reliability, is passing away, because the most serious failures have come from somewhat trivial causes, that are too often traced back to a complication of apparatus so great as to increase rather than decrease the possibility of failure.

Efficient Service from Mine Locomotives

CONSIDERABLE progress in the design and utilization of electric locomotives for mining service has been achieved in recent years. The contrast between old-time equipments and later apparatus for this severe work reflects no little credit upon manufacturing engineers. If users will now do their part in intelligent selection and thorough supervision of this class of motive power after installation, gains in economy through better utilization of energy and through increased production can readily be attained.

Industrial engineers without experience in the traction field are liable perhaps to consider the buying of a haulage equipment on the basis of sustained capacity and tractive effort—two most important factors in electrifying mine transportation, but by no means the only requirements. After very little investigation, the necessity of close co-operation with manufacturing engineers is evident, for the mechanical features of the equipment and the electrical characteristics of the mine railway system are closely tied in with successful service.

The choice of the number of motors, the advisability of dynamic braking with its price of increased motor sizes, the type of control best suited for particular cases, clearance limitation, framing structure and ventilating characteristics desirable, the alignment and grade of the trackage, all bear heavily upon the proper selection of equipment. Engineers with an analytical turn of mind find the plotting of speed-time-distance curves, current and voltage graphs, etc., helpful when selecting electric locomotives for specified service in mining, and thorough studies of this kind enable more intelligent relations to be established and maintained between manufacturer and buyer, despite the fact that the engineers of the former are naturally specialists in the use of these analytical tools.

Increased efficiency through the use of accessible running gear, open-side frames, alloy-metal resistor

units and the contactor type of control cannot overcome the bad effects of a poor distribution system, and the importance of insuring a decent working voltage under extremely unfavorable conditions can hardly be overestimated. There is little excuse today for letting the voltage at the motors drop to 50 per cent of normal with the economies of distribution now available through the automatic substation. In many cases low voltage causes more abuse of equipment than all other factors, and reserve capacity is oftener needed for this than for other causes. As a result of automatic control at well-planned distribution centers, safe and more constant power conditions can be maintained, and this means increased output at the mine. Regular tests of energy consumption, track and line conditions by portable instruments on electrically hauled trains demonstrate the value of technical supervision in this field of electrical service, which is one of no small importance.

Light Railway Equipment as a Step Toward Railroad Electrification

TRUNK-LINE electrification of railroads is no longer a question of engineering but strictly one of finance. The economy of main-line electrification under certain conditions is recognized, at least by those who are fully informed. The problem is how to undertake the herculean task of raising funds for electrification even in the certainty that the change can save money.

The Chicago, Milwaukee & St. Paul electrification, a very fine job from the engineering standpoint, ran toward $30,000 a mile without the development of power or the building of power houses, the energy being purchased. Had these other items entered, the cost would have gone above the figure just mentioned. When one realizes that some of the long Western lines were originally built and equipped completely for a figure no greater, it is self-evident that the chance for rapid development of electric service is very small until the railroads shall have recovered enough from the desperate condition into which government mismanagement plunged them to take advantage of the opportunities for improvement that electrification offers.

With reasonably heavy traffic there is no doubt as to the issue. So long as traffic is light, however, the odds are against success unless the situation is squarely met by adopting some such method as the light electric railway—that is, converting an ordinary railroad into a system resembling the less heavily equipped interurban systems. This step might now and then be a very useful and profitable one, but on the whole the tendency in this country has been, perhaps unwisely, directly against what are known elsewhere in the world as light railways.

By "Hire" and "Hire Purchase"

THOSE who still disapprove of the installment selling of household appliances by the central-station company or hesitate to embark on this commercial venture, new to them, should lift their minds a moment out of the habit-formed groove of their selling experience and consider these facts: Already 90 per cent of the large appliances introduced into American homes today are being sold on easy payments. Many central-station companies are doing it. Many contractor-dealers and electric shops are doing it. Many department stores are doing it. Many manufacturers are doing it. Books are sold that way. Pianos are sold that way. Furniture is sold that way. Phonographs are sold that way. It has become standard practice in the selling of all kinds of household equipment that costs a considerable sum. It will be no new experiment in merchandising.

Before the central-station industry stands a tremendous opportunity. Five million homes wait to be wired and equipped and connected to existing lines. Seven million other households need more appliances. They can be sold and the selling can begin right now if the hard times are met with easy terms. But the hard times are passing away. Good times are slowly unfolding. Good selling will come with them. The volume of this selling, however, will be in direct proportion to the ease of buying.

In England, where the "electricity undertakings" are far more backward in commercial development than are the utilities of America and where electrical appliances have not won anything like the popularity they enjoy here, they are meeting the hard times with easy terms in two ways. They are both advocating and applying two methods of sales which they call "hire" and "hire purchase." In other words, they are selling appliances by installments and they are renting them. Surely, if this is being recognized as necessary and desirable in conservative old England, we should not falter here. The purpose is to get appliances into common use and build up a universal popularity. Why should we question any honest method of selling that experience has proved to be profitable?

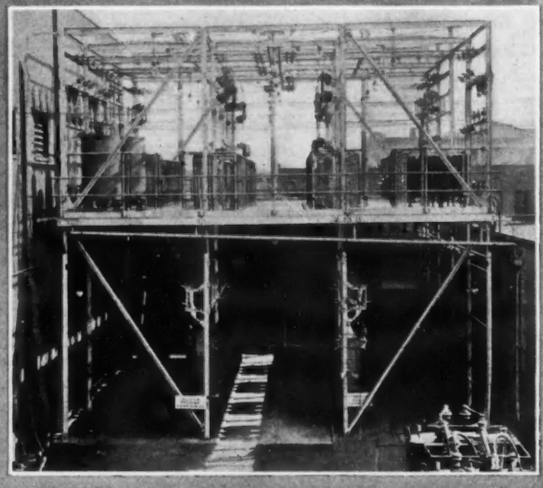
Small Reserve Is Striking Evidence of Service Reliability

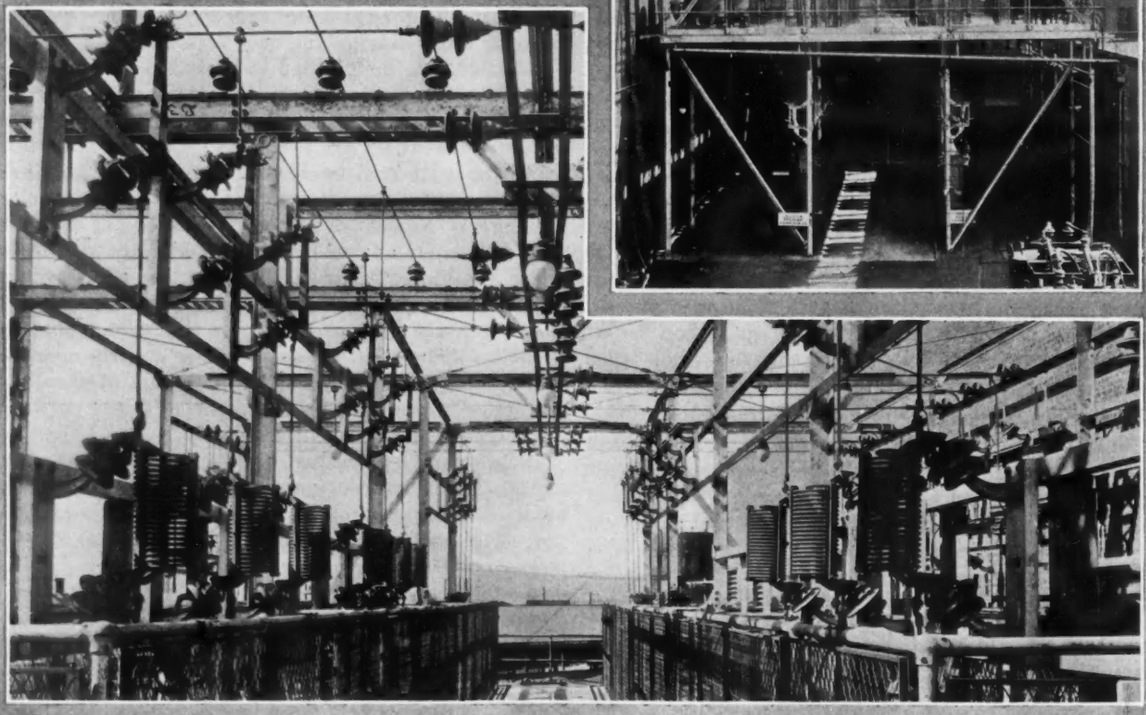
THE total rating and distribution of electric plants, which we publish this week, gives serious food for thought. The aggregate capacity of the generators running today reaches the enormous figure of more than 14,450,000 kw., distributed in more than 5,500 stations. Of these stations more than a quarter are hydro-electric, representing a still larger proportion of the total energy, but with this there are more than 4,100 central stations operating with coal or oil as a fuel and facing the uncertainties of future supply. Of the total capacity of the country New York has more than 10 per cent, Pennsylvania nearly as much, while Ohio is a good third with above a million. A very striking feature of the situation is the small amount of reserve equipment, showing how closely central stations have been living to their limited capacity. The total reserve is only a little over 1 per cent of the capacity operating, and west of the Rockies no actual reserve is reported, the factor of safety lying chiefly in interconnection.

It is a very impressive list, this of the great central-station industry, representing as it does huge investment of private capital and prodigious possibilities of industrial usefulness. The municipal stations are fairly numerous but represent a comparatively insignificant part of the total output. We know of no stronger evidence of the growth of the industry than is furnished by such data as these. The possibility of operating with such a small reserve as is here shown is indisputable evidence of the general reliability of the electrical equipment as well as of that rapid growth which has made keeping ahead of the demand a practical impossibility.

Entire Electrical Bay of El Paso Station Built Outdoors

INCREASED space between conductors and between apparatus, greater accessibility for inspection and maintenance and reduction in cost of building foundations, walls, roofs and isolating barriers are some of the advantages which were realized by building the entire electrical bay of the El Paso Electric Railway Company outdoors. A general view of it is shown in the illustration immediately below, while glimpses of the ground floor and second floor are shown at the left and at the bottom of the page respectively. On the ground floor are the oil circuit breakers with their disconnecting switches, the former on pipe frameworks and the latter on hot-galvanized structural steel well above the floor. The control wiring is entirely in rigid conduit. On the floor above are buses, disconnecting switches, current-limiting reactors, choke coils and oxide-film arresters. The reactors were especially designed for outdoor service by being treated with linseed oil and covered with either paint or baked enamel. Circuits connecting the electrical bay with the generators are run underground through single-conductor, rubber-sheathed cable in fiber conduit, while those leaving the station are overhead or underground as required.





"Family Spirit" in the Public Utility

Humanizing the Organization Without Departmentalizing Employee Relations—Mutual Confidence Held to Be a Greater Power than Excessive Systemization—No "Little Jobs"

By H. A. LEMMON
Personnel Department, Stone & Webster, Inc., Boston

THESE pungent thoughts from Mr. Lemmon on the subject of the spirit within the organization of a utility company follow quite naturally his previous article which discussed the relationship between the public service company and the people. It was entitled "What the New Customer Thinks on the First Day," and because it painted a very human picture in a very human way of the costliness of bad first impressions it has occasioned much interested comment. This paper must not be taken as a general indictment of group insurance, but rather of the halting spirit and foreshortened vision which are content with nothing more than an artificial and impersonal relationship between a company and its employees and then wonder why the kind of loyalty and service thus begotten has little heart in it. Group insurance where it is but one feature of an organized family relationship, in which the bonds of interest, mutual service and interdependence are forged of human feelings, is something else. In a word, Mr. Lemmon's thought is that no family can do its best if it is unhappy, and he shows that happiness among the members of a "utility household" must be builded of those selfsame human factors that make happiness within a home.

I AM GOING to speak very frankly to the readers of the ELECTRICAL WORLD about the importance of "family spirit," or, better still, "gang spirit," within the company. Before our public utilities can even hope to take their proper places as givers of real service and earners of fair return, they must be imbued with this most powerful incentive to play their part after the fashion of man to man and with the minimum of mechanism designed to better human relations. The first organization and the only one which has survived throughout the ages was invented by Nature—we call it the family—and no genius or industry of man directed against it has ever been able to break it down. Therefore it must be a safe organization to accept as a model, and when we do that we can hardly be accused of yielding to a passing fad.

Why don't we get this spirit in so many of our modern utilities? We fail to do so simply because we don't really desire it hard enough. Yet the office force cannot handle the public intelligently unless its members know their work, and they cannot know their work if the manager runs his business like a secret society of which he is the sole member. Information within the family circle is the first step toward public relations.

"Public relations!" They're all doing it. The shelves are fairly loaded with volumes prepared willingly and anxiously to instruct harassed corporation managers how to attain good public relations. The magazines are full of suggested methods and experience, and if only you will send $6 and get Professor Splifkins' book on "The Unit in Industry" and follow its precepts, your employees will immediately begin sitting up nights knitting "God Bless Our Home" mottoes for your office. I will not attempt to describe Professor Splifkins nor relate the sum of this actual experience with the problem he handles so learnedly. If the reader who is a manager lacked imagination, he would not be holding his present post.

WHEN DID GROUP INSURANCE EVER REDUCE LABOR TURNOVER?

I have had the pleasure of discussing the subject of family spirit with some of the distinguished gentlemen who are engaged in this work for a number of great industrial organizations. Of course they have group insurance, which bids fair to become very popular during the next few years. Group insurance is a wonderful thing. All the employees are bunched and for approximately $10 a head each will receive a beautifully lithographed certificate or policy from the Panacea Insurance Company entitling a man's widow to $1,000 if he dies on her hands during the ensuing year. Life insurance is a splendid thing, no doubt of it; but the beauty of group insurance is that you do not have to die to begin receiving benefits. For while you are still alive that insurance company will from time to time send you little pamphlets such as "How to Keep the Baby Well," "Infantile Paralysis Is Dangerous," "All About Milk," "Health and Happiness in the Home," and so on; and if the group is large enough, it may occasionally include medical examinations and free advice. The insurance companies are a unit in their declaration that group insurance will help all domestic troubles and will reduce the labor turnover—magic phrase! I know of no statistics which show how much group insurance has reduced the labor turnover in any plant, nor of any actual proof that it has reduced it at all. Nor do I know of any instance where the employees indicated that they even wanted group insurance. They never do if they have to pay any portion of the premium. The man who wants life insurance is the old employee with a family and other nearby responsibilities. There is not a bit of danger that he will ever leave your employ voluntarily, and the young man whom you would like to nail down to your own particular service does not care a snap whether you give him life insurance or not.

YOU CANNOT BUY LOYALTY

Just as soon as all companies in your field have adopted group insurance it can yield no particular advantage to any of them. To carry out this paternal effort to purchase loyalty, you, Mr. Manager, will have to add accident and health insurance and thus set a pace which all of your rivals must follow. When they catch up with you in this it will be time to incorporate an old-age pension scheme, and so the race will go on progressing and no final goal be reached.

A lot of companies have officials whose sole job is to bring about the family relationship in corporate organi-

zations. These men are called "industrial relations managers." Is that not a title to cover a department which presumably is trying to make an organization human? What a wonderful thing it would be if a manager could set up a machine in his office, and whenever he felt the need of injecting some real, garden variety of human spirit into his organization drop a ten-dollar bill or a thousand-dollar check into it and accomplish the desired result! Yet the insurance company and the industrial relations managers are attempting to perform just the functions of that machine and in virtually the same manner. The "automat" doesn't seem to have displaced the personal-service restaurant—yet.

If I were a manager with a free rein, I would not under any circumstances permit an insurance company or a nickel-in-the-slot machine to get in between any of my men and myself. I would never promise any of them to endeavor to compensate their widows. But a few days after Jim Smith's funeral I would drop in upon Mrs. Jim Smith—and it would not be the first time I had called since Jim's death, either—and I would sit down and talk things over with her. I would let her talk about Jim too if she wished, and if it made the world any brighter for her to cry, I would not mind, because if Jim had been working for the company for twenty years or any considerable time, he would have been more or less of a comrade to me as well, and I would not feel so cheerful that his widow's tears would seem entirely out of place. Then I would talk with her about the future and the future of the children, would meet her fear that little Jimmy junior would have to quit high school and begin to earn money with a suggestion that I guessed we could see that James junior finished school. I would find out all about her affairs, financial and otherwise, and I would advise her just a bit more carefully than I advised my board of directors about company business and together Jim's widow and I would plan out the things she and hers must do. And then before I left I would like to hand her a check for $1,000, and that check would not be signed by the Panacea Insurance Company, 2,000 miles away, either. It would bear the legend "Ringville Power Company, by H. A. Lemmon, Manager." It isn't so much what you do as how you do it.

LET US LEARN EVEN FROM TAMMANY

It is very interesting to learn what this company and that company are doing to tie their workers to them, but my own personal opinion is that I shall seek for knowledge in an entirely different quarter—Tammany Hall. Give me twenty minutes' observation and study of the history of Tammany Hall, and as far as I am concerned you can burn the libraries on industrial relations, and the country's greatest industrial organizations won't need to copyright their own pet systems on my account. Tammany Hall does not send booklets about the cold-pack method of preserving tomatoes where the family of a faithful follower is out of food or requires medicine. Instead, it sends food and shoes and money when it's needed. Now, of course, if I knew anything about the financial end of operating a company, I would know that it is not business to loan money to employees, that you will lose most of it if you do, and, besides, the act will accomplish no good purpose. The whole thing is unsound and unscientific. There is nothing wrong about this statement as an item of news except that it is old. It is strange that some managers have been so slow in comprehending a fact as self-evident and so generally conceded, and just because they are not losing any considerable amount of money they make loans to distressed employees, and I suppose they will continue to go through life not knowing how impossible their success is.

Tammany Hall holds its rank and file through thick and thin because it treats them in a thoroughly human manner and because it does not know the meaning of the term "industrial relations." Tammany does not always capture enough votes on the outside to win every election, but it goes into the fight with a united family, and, come to think of it, its batting average is not so far from 1,000 at that. And so, as between the professors who really would not know a family spirit if they met one in a bottle or in a churchyard, and the very wise, subtle, human politicians who handle Tammany Hall, my money goes on the Hall.

THE INDUSTRY MUST BE HUMAN

The public utility industry has tried politics and failed; it has tried legal battle and failed, and now if it is to survive, it will try the only thing which has ever had a chance to win and which since man was first created has never failed—the human touch. If we think people are fundamentally unfair, dishonest or unintelligent, then we should immediately get out of the utility business, for as the people are, so they have been since the beginning and so they will presumably be to the end. We must climb down from our high horse and get to earth. We must put something besides brains and money into our business. Our most famous American of recent years is remembered because he was human, and paradoxically his human weaknesses were his transcendent strength.

Very frequently some man or some corporation or some government thinks it can ignore human nature and the human touch. Disastrous failures follow, and they always will. Every manager today is confronted with the choice of humanizing his organization or of wrecking it. He cannot drive his public, but he can lead it. A community is built up by men who give more to it than they take out. Companies will be built up by managers who put more of themselves into their organization than they take out. To accomplish what we are seeking we must know the human side of our business—not only the managers must know it, but the cashiers, meter readers, collectors and clerks. These people are really the company to the public, and it is that same public which pays or refuses to pay our salaries and a return upon our stockholders' investment. We must abandon the idea that these are little jobs and that any one can fill them. In all solemnity, it is easier to furnish a manager for a new company than a telephone girl who will handle that job as it should be handled.

The secret of the whole thing—if it be a secret—is to be found in taking care of the little things, the minor points of contact with people. Very small keys will unlock very large doors both in an organization and in a community. If the little things are perfected there will not be any big problems to solve. We cannot properly exist on legal battles, on increasingly vicious legislation, on unwarranted financial assistance, on mistrust, on misunderstanding. We *can* prosper and give real service to the public when we gain its confidence—its good will. We can gain good will by being human. The man who does not recognize this fact was behind the times the very moment that Eve threw away the first apple core and human nature became an established fact.

Possibilities in Radio for the Central Station Company

Radio-Telephone Broadcasting Apparatus on a Commercial Basis—Some Difficulties the Central-Station Experimenter Must Face—Problems of Regulation

By J. C. MARTIN
Western Editor ELECTRICAL WORLD

WHAT possibilities has the radio telephone for use in the operation of transmission systems? The answer depends on the answers to two other questions. The first concerns the percentage of perfect operation that can be obtained, and the second the distances that can be covered at the given percentage of reliability. There can be no question as to the value of the radio telephone if it in any way approaches the wire signal systems in reliability. Some of the experiences of the past year in the broadcasting of musical and other entertainment may shed light on the problem. Before considering the results of this work it should be noted that there are two classes of so-called wireless-telephone uses that present advantages from the standpoint of the transmission system operator. The first is the "wired wireless" (really carrier current) in which a high-frequency current is imposed on the transmission line itself and the messages are in turn superimposed on the high-frequency current. An arrangement of filters separates the message at its destination from the carrier current and permits its delivery to the proper destination. The carrier current is not confined strictly to the conductors of the transmission line, but these conductors act as a guide. Messages can be picked up a short distance from the line, and in case of breakage of the transmission conductors the gap can be bridged by retuning the circuit, though some knowledge and skill is required of the operator. In general, the system as far as its present development is concerned gives promise of being extremely useful. It may be limited to the work that is now done by wired circuits along transmission or distribution lines, but owing to the ability to bridge gaps, the saving in investment in the cost and maintenance of wire lines and the ability to reach some distance away from the wire-line guide, it may be an improvement on the present system. Its freedom from interference such as is experienced in straight radio work and the fact that licensed operators are not needed are added advantages. It also insures secrecy of the messages, a result that is not possible so far with the radio telephone.

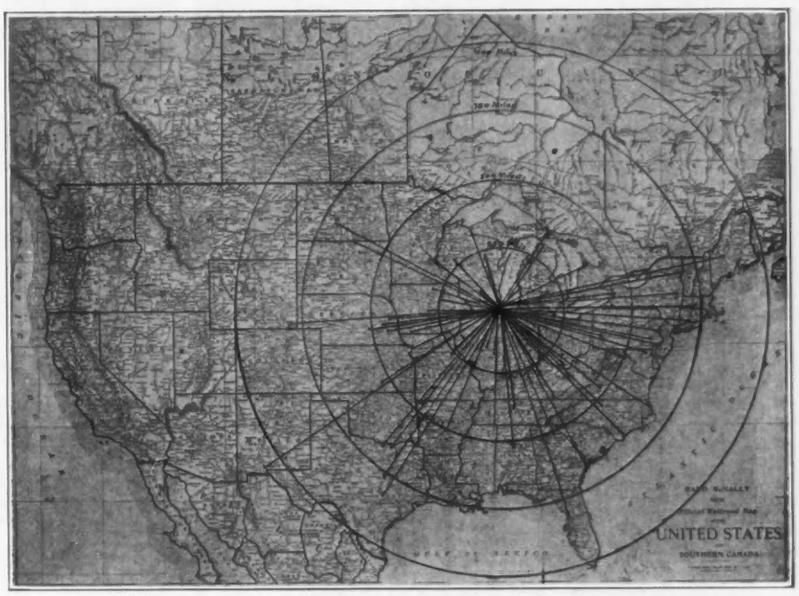
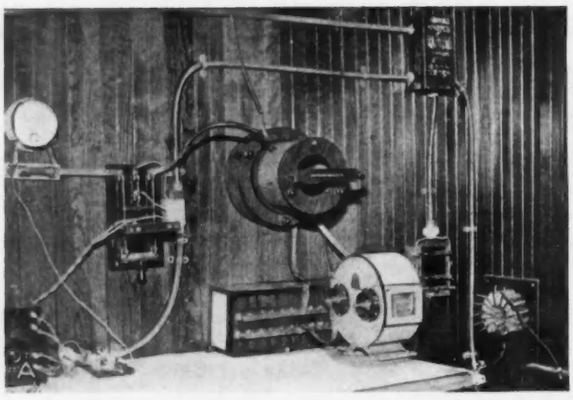


FIG. 1—SOME OF THE POINTS THAT HAVE BEEN REACHED BY BROADCASTING FROM THE WESTINGHOUSE RADIO TELEPHONE STATION IN CHICAGO

The other system is the radio telephone, which has developed from the radio telegraph. The development of the vacuum tube as a transmitter, detector and amplifier has given an impetus to this form of communication which has proceeded so rapidly in the amateur field that in the last six months the more important commercial phases have been temporarily lost in the effort of manufacturers to supply the overwhelming demand from the amateur trade. It is estimated roughly that there are 25,000 amateur radio transmitting stations in the United States. Several months ago it was estimated that there were at least eight receiving stations for each one transmitting, but Secretary Hoover has recently made an estimate indicating there are more than 600,000 stations, including transmitting and receiving, in the United States. In this fact resides one of the difficulties that the central-station company experimenting with the wireless telephone must reckon with. The commercial broadcasting stations have become sufficiently numerous, in view of the wave length to which they are restricted, to encounter difficulties due to direct interference or "blanketing." The direct interference is manifested in the picking up and intermingling of two programs that may be sent out at the same time on the same wave length. The "blanketing" effect is noticed in the lesser volume of sound in the receiver from a given station and in "whining"

Applicability of Radio to Utility Requirements Is Attracting Widespread Attention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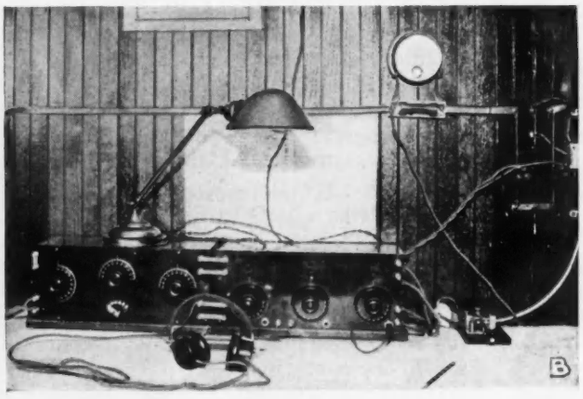

B

C

D

E

MANY public utilities, both electric service and railway, have become intensely interested in the radio telephone as a means of transmitting operating instructions. Although a number of the companies have been experimenting to determine the limitations of this form of communication and methods of overcoming the problems encountered, none are ready to announce their conclusions up to the present time. The transmitting and receiving apparatus and antennas at two termini of the San Joaquin Light & Power Corporation's system are shown in A, B, D and E respectively. C shows a radio installation on one of the Chicago, Milwaukee & North Shore trains.

or "howling" in the detector and amplifying tubes when the other broadcasting station is at such a distance or the atmospheric conditions are such that its signals are not directly audible. A concrete illustration of this was noticed lately in Chicago when the effect of a station several hundred miles away was felt. The distant station was operating on a schedule that only slightly overlapped that of the Chicago station. When the distant station shut down an immediate increase of volume of transmission from the Chicago station was noted and a loud speaker that had been rather unsatisfactory in its operation performed beautifully for the remainder of the program. On another occasion, with exceptionally clear atmospheric conditions, the two programs came in in almost equal volume so mixed as to be indistinguishable. Some of the practical difficulties that must be faced by the experimenter follow:

Operating Limits

Present radio laws were established before the time when the radio telephone came into the field on a basis that would permit of more than experimental work. The restrictions and license requirements are therefore based largely on the needs of the radio telegraph. Since the use of the telegraph for central-station work does not offer any advantages over the present wire telephone systems, because it must, in the nature of things, be confined to those who understand the telegraph code, the restrictions that must be met in the use of the radio telephone are the only ones of interest to the central-station men contemplating the use of radio. Recently it has been thought necessary for the Department of Commerce to suspend broadcasting of musical and other programs by amateur stations because of interference with other radio traffic. Some difficulties have been experienced between the commercial broadcasting stations because of the limitation placed on the wave length they can use. The result was the calling of a conference in Washington which it is hoped will result in new regulations and legislation.

At present central stations undertaking to use the radio telephone would do so under limited commercial licenses of the second class, and operation would be at wave lengths of under 600 m. or over 1,600 m. The usual arrangement on an operating property would be the installation of a few fixed stations at the principal operating points where dispatchers are stationed, with the use of a number of movable stations with transmitting and receiving apparatus carried by construction or repair gangs. Under present laws each station, fixed or portable, must have a second-class operator. Understanding of the international code is an absolute requirement, so that in cases of interference with telegraph stations the interfering station can be informed of the fact and obey the regulations that govern such cases. The fact that small power may be used cannot be relied on for prevention of such interference with distant stations. So-called "freak" cases of long-distance radio transmission with low power are frequent enough to be embarrassing and suggest a suspicion that they may not be so freakish as they seem. Recently a Middle Western radio station that is experimenting along the general lines that central stations must follow was working with a portable station less than 20 miles away. It was found necessary to desist for the time being because of interference with an Atlantic Coast commercial station that was working on the same wave length and using the international code.

The question has been raised whether control over portable stations by the fixed stations on a system would not be sufficient to eliminate the need of there being some one at the portable station who understands the international code. While this is theoretically possible and might be practicable if applied to only one class of users, the argument against it is that it opens the way to the removal of restrictions in other directions on grounds just as logical, and that such action would eventually produce confusion due to the number of excepted stations and the certainty that at least a portion of them would be out of control at some time and there would be no means of reaching them. Interference with important naval, government or commercial stations that may be handling distress or other important messages is one of the points that cannot be lost sight of in the formulation of regulations and in the face of the operation of an increasing number of stations. Any one going into the operation of the radio telephone should carefully study the laws and rules laid down by the Department of Commerce and consult the radio inspector for his own district.*

Stations operating on the international telegraph code are numerous enough in the class in which central stations are interested to make it likely that some one will be working on any particular wave length at almost any hour of the day. In the case of distant stations the interference may not be experienced constantly, but it may often be enough to become decidedly embarrassing. With nearby stations it may be necessary to make some adjustments of wave length or time of operation that will eliminate the trouble. Another problem is that of interference from or with amateur stations operating theoretically at 200 m. or less. The word "theoretically" is used advisedly, because there are many of the amateur stations that are not equipped so that they know exactly the wave length they are operating on, and provisions for sharp tuning are inadequate. Even with a radiophone station operating at somewhat above the amateur wave length and provided with the best of equipment, there is the possibility of some interference with the neighboring stations.

Interference from Amateurs

Interference from amateur stations will come from those with poor facilities for tuning or those that may be willfully violating the law. In congested districts this trouble will be annoying and sometimes very serious, particularly during the evening hours, when the amateurs have the most time for their experimental work. In many localities the air is a perfect hubbub of radio-signals at short wave lengths, particularly between 7 p.m. and 10 p.m. Another source of interference will be from the presence of buildings or other structures containing large masses of steel. In the establishment of stations some of the difficulties of securing satisfactory operation will be eliminated if such localities can be avoided.

Still another trouble that will be met with is the "dead" spots that are frequently found in a territory in which it is sought to work. The experience in broadcasting of entertainments has shown, for example, that in some localities a station approximately a hundred miles away will be picked up with difficulty while one several times that distance will be picked up with ease. In other cases it may be almost impossible to

*Copies of the law may be secured at 15 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

pick up a given station, although in localities much farther away it may be picked up easily. No satisfactory explanation has been given for the phenomenon. In the latter case the difficulty has been encountered under circumstances that have led some to ascribe it to the presence of large power distribution systems that act as a screen both to blanket the transmission from stations in the area and to deflect the waves over the area until they are reflected toward it again by some atmospheric or other condition. The formation of the earth has been blamed, but occurrences of this nature in perfectly flat country have been noted. These seem to support the theory first mentioned, though power systems are not the only cause, as such troubles have been encountered where no extensive systems exist.

Taking these two factors together, the biggest single influence will probably be the atmospheric conditions at any given time. During violent storms, particularly the summer storms that prevail in some sections of the country, the interference from atmospheric disturbance may put the radio telephone out of commission completely for short periods. In the early days of the radio telegraph the same experience was gone through, but with the developments that have taken place the percentage of perfect operation approaches a figure that compares favorably with other methods of communication. Telegraph stations now work through atmospheric conditions that a few years ago were thought to make operation impossible. The present situation with the radio telephone is not so good as this, though there is no reason to suppose that reliability will not be developed as experimental work proceeds. The experience of the broadcasting stations is a guide by which the matter of distance can be judged.

RELIABILITY AND DISTANCE

In the area around Chicago such a thing as failure to receive the radio concerts is virtually unknown, if the right sort of apparatus and a decent antenna are employed. In one case, at a distance of 18 miles, the broadcasting has been received without one failure night after night with a single tuning-circuit home-built receiver employing a vacuum-tube detector and first one and later two steps of amplification. The antenna is a makeshift and consists of two No. 12 stranded phosphor bronze conductors, 25 ft. (7.5 m.) in the air and 50 ft. (15 m.) long, strung between two trees and shielded by rather heavy trees. Close proximity to the house is also a detriment. Under these circumstances there has not been the slightest hint at failure in reception, and the concert is usually audible all over the house with a two-stage amplifier set and a cheap horn. Occasional interference from other stations and annoyance from static discharges are the worst that have been experienced.

In a case of experimental work in the Middle West in which the conditions to be met are similar to those in central-station work communication is carried on between a fixed station and portable stations carried on movable vehicles over distances up to 20 miles, without any difficulty and with a percentage of reliability that, it is claimed, is more than 90 per cent. One difficulty encountered is that of dead spots that seem to have some relation to the wave length on which transmission is being made. The distances over which consistent transmission and reception can be expected with well-designed apparatus seem to be somewhat uncertain, though the percentage of perfect operation up to 100 or 150 miles (160 to 240 km.) seems to be fairly high with the present commercial stations.

In general the central-station company taking up the radio telephone for use in its operating work must expect to do a great deal of experimentation and to face some rather discouraging failures. The apparatus is in its development stage. Some things are known and some extremely encouraging results in the experimental work done by amateurs have been achieved. The statement has been made that the commercial broadcasting work is distinctly out of the experimental stage and that the apparatus used is on a real commercial basis. This assertion seems to be fairly well backed by the experiences of those who have been fortunate enough to enjoy the results.

Inductive Interference as a Business Problem

Solution of Legal and Technical Problems Necessary to Intelligent Business Solution—Public Must Be Considered—Full Knowledge of Factors Necessary

THAT the inductive-interference problem is a business matter and will be settled by business men who will decide what concessions shall be made by those whose property is involved is a contention that has been made rather frequently. With a few important qualifications the assertion may be taken as correct. In the minds of many who have rather carelessly repeated the assertion the thought has existed that nothing more than a few matters that will be the subject of compromise are to be considered.

The first and important consideration from the standpoint of the business man directing the destinies of a public utility is the service that he is able to give the public. Unless the field is broad and restrictions are at a minimum, the profits that he must obtain to make the business successful will either be non-existent, thus making a continuation of the business impossible, or will be reduced to a point allowing the business only to limp along in a lame-dog fashion that will not make its maintenance an attractive problem. The first problem that the business man of the signal or power company is interested in is seeing that the development of the service he proposes to render is unhampered to the largest possible degree.

As has been indicated in previous articles, the factors that will determine the limitations to be placed on either power or signal service will depend on the success which the technical branches of the industry will have in the development of methods of control of the forces that have caused the embarrassment. This success will depend on two things, the first being the degree of restriction that is placed on the development of each class of service in its technical development. This success will be in inverse ratio to the degree of restriction. The second condition is the commercial restrictions involved in the cost of control measures that shall be eventually found necessary. Of these two the business man is interested primarily in the latter, since in the final analysis he must think in terms of dollars-and-cents cost of service. The answer that the technical men must furnish him will, therefore, be the kind and cost of protective measures that he must expect to employ in any system he expects to build and operate. Not only must he have this information for his own system,

but he must have the same information for the systems with which he must work and live in close proximity. And finally he must have the cost of co-ordination of the control measures for the different systems with which his must be co-ordinated. Then and only then will he be able to sit down with the men responsible for the opposing systems and intelligently compromise on the measures that he must use.

He still lacks one element, and that is the answer to questions that have a legal phase. It is at this point that the entire problem presents an appearance that, while present in all phases of business, takes a peculiar turn in the public utility business. The utility man is engaged in a business that, for one reason or another, has been deemed by the public to be a proper subject of special regulation. Essentially it must be a monopoly if it is to give the greatest possible service in an efficient and satisfactory way. Whether the regulatory policy of the present day is the proper one or not needs no discussion here. So far as utilities are concerned, it is a settled policy that is receiving their support and is therefore an accomplished fact. Whether for good or bad, it must be considered.

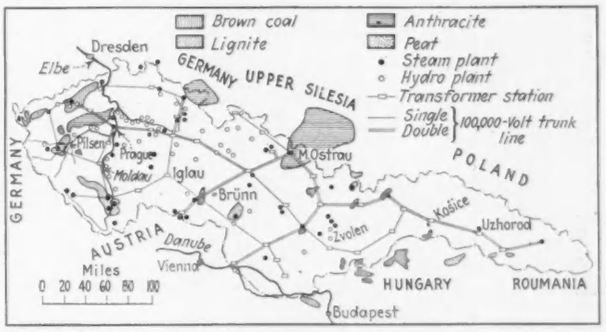
PUBLIC RELATIONS ASPECTS

With public control recognized and monopoly established, the rights of the public enter in an extremely direct way and the problem is no longer one of the rights of two individuals. It has become a problem of the rights of three, with the third holding the priority on any question directly affecting its interests. The problem therefore becomes an important one in its public-policy phases, and whatever settlements are made must be of a character that will at the end give the public the greatest possible service at the least possible cost. It is consequently necessary that the business men who will have the final say in the compromise settlement shall have before them the answer to the problems that must finally, in one way or another, take the status of law, either through practice, legislative or court channels. The questions cannot and will not be answered in a short time or in a body. Some of them have already developed and need answer at the present moment. In fact, the attempt to find the answer has already been too long delayed, and some of the troubles of the moment are attributable to that fact. Many of the important problems are yet to be developed and will be reached as the electrical industry proceeds in its course. The important thing is to be up and doing. The answer to present problems must be found and the service needs of the moment cared for. Inevitably the problems of the future will be indicated in the work of solving the problems of today. The greatest need now is the support of the business man in the working out of the problem. Neither the technical nor the legal phases can be worked out so long as the men who are the final arbiters refuse to recognize the problem in its entirety and refuse full support to the work needed to find the solution. At the bottom the problem is not an unnatural one.

Industries as directly related to the interests of the public as the electrical industry is cannot afford to take part in any controversies that may in the end deprive the public of something it wants. The only result of a course of this kind would be an invitation at some stage for the public, through its authorized representatives, to step in and settle the controversy in its own way. For this reason, if for no other, the settlement of the problem through courts or commissions is a questionable course. It means a long and expensive fight with a burden on the industry as a whole for which little or nothing would be received. The standing of the contestants in public estimation would suffer, and the hard-won public respect that the industry has gained in the past ten years might be completely sacrificed. For this reason it is important that the work undertaken jointly by the National Electric Light Association and the American Telephone & Telegraph Company be given the undivided support of the entire industry. Across the table, with all the facts in the open, is the only sane way to handle the problem. "Button, button, who has the button?" has no place in the negotiations. Settlement is not possible on the basis that it is a game in which the keenest brain can win and the loser must take a handicap. The forces involved are those that answer to no master except the one who handles their controlling laws in such a way as to prevent harmful manifestations and confine their effects to useful channels. Playing a game of compromise, except on a basis of real and known facts in which the compromise follows paths that will bring results, will not control these forces. In the final analysis the solution that makes for the greatest interest of the public will make for the greatest interest of the entire industry.

Czechoslovak Republic's Plans for Electrification

SYSTEMATIC plans for the electrification of the Czechoslovak Republic have been made by a specially appointed consulting board, as was fully explained in an article by Prof. Fernando Pietsch in the Aug. 20, 1921, issue of the ELECTRICAL WORLD. The accompanying map shows the system of trunk lines and interconnections upon which the work will be developed. A study of the map indicates the scattered location of the coal fields, and, in fact, a large portion of the electric generating plants will be built at or near coal fields. All the trunk lines are three-phase, 50-cycle, 100,000-volts, and all the plants are to be tied in to form one great uniform national system.



RELATION OF PROPOSED CZECHOSLOVAK TRANSMISSION SYSTEM TO COAL FIELDS

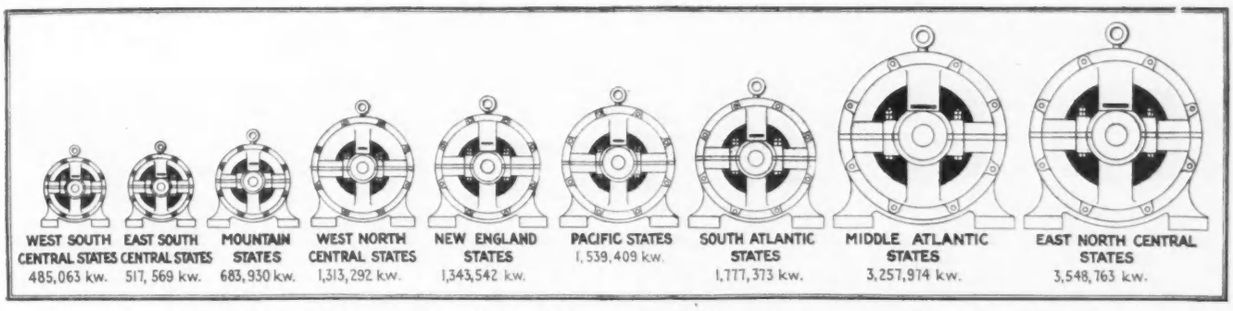
The cost of the new steam station, the trunk lines and the feeder lines is estimated at 1,500,000,000 crowns. These stations and the network should be completed in twenty years and the hydro-electric development in fifty years. The state will build all the water-power plants in co-operation with the county administrations, and the steam plants will be erected by public utilities.

Installed Generator Rating of Central Generating Stations and Distribution of Operating Companies and Plants

State or Section	Rating of Installed Generators (Oct. 1, 1921)			Operating Companies		Companies Generating Their Energy		Companies Purchasing All Energy				Companies Generating and Purchasing		Companies Purchasing Energy (Reserve Equipment)		Generating Stations				Hydro-Electric Plants	
								Private		Municipal						Private		Municipal			
	Operating Kw.	Reserve Kw.	Total Kw.	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
United States	14,297,338	169,577	14,466,915	5,624	100.0	4,460	79.5	748	20.5	416	20.9	359	6.4	193	3.4	3,543	64.1	1,989	35.9	1,421	25.7
SECTIONS																					
New England	1,287,725	55,817	1,343,542	350	6.2	228	65.2	89	31.1	33	51.6	46	13.2	20	5.7	277	81.3	64	18.7	222	65.1
Middle Atlantic	3,229,814	28,160	3,257,974	592	10.5	422	71.4	140	29.2	30	26.5	59	10.0	27	4.6	462	80.3	113	19.7	198	34.5
South Atlantic	1,761,025	16,348	1,777,373	659	12.8	539	81.9	62	15.9	58	21.5	32	4.9	36	5.5	363	55.8	270	44.2	160	25.3
East North Central	3,524,032	24,731	3,548,763	1,174	20.9	873	74.4	204	28.4	97	21.2	75	6.4	40	3.4	638	58.3	457	41.6	278	25.4
West North Central	1,295,927	17,365	1,313,292	1,419	24.2	1,137	80.0	134	17.8	148	22.2	70	4.9	43	3.0	619	48.2	667	51.8	127	9.9
East South Central	497,344	20,225	517,569	358	6.4	329	91.9	21	9.7	8	5.6	16	4.5	6	1.6	226	61.4	142	38.6	33	9.0
West South Central	478,132	6,931	485,063	545	9.7	514	94.4	23	6.0	8	4.8	14	2.6	7	1.3	405	70.8	167	29.2	17	3.0
Mountain	683,930	0	683,930	300	5.3	256	85.3	32	13.4	12	19.7	20	6.7	8	2.7	304	83.3	61	16.7	182	49.8
Pacific	1,539,409	0	1,539,409	227	4.0	162	78.9	43	24.0	22	45.8	27	11.9	6	2.6	249	83.8	48	16.2	204	68.7
NEW ENGLAND:																					
Maine	116,011	270	116,281	75	1.3	55	73.4	20	28.1	0	0.0	8	10.7	4	5.3	78	95.2	4	4.8	69	84.2
New Hampshire	51,077	1,080	52,157	49	0.8	37	75.5	12	26.0	0	0.0	2	4.1	2	4.1	53	94.8	3	5.2	38	67.9
Vermont	87,344	275	87,619	56	1.0	42	75.0	10	23.8	4	28.6	8	14.3	1	1.8	58	80.5	14	19.5	66	91.7
Massachusetts	689,375	50,542	739,917	119	2.1	63	52.8	32	39.1	24	64.8	14	11.7	12	10.1	45	54.8	37	45.2	30	36.6
Rhode Island	143,283	0	143,283	12	0.2	4	33.3	6	60.0	2	100.0	3	25.0	0	0.0	4	66.7	2	33.3	2	33.3
Connecticut	200,635	3,650	204,285	39	0.7	27	69.3	9	25.7	3	75.0	11	28.2	1	2.6	39	90.8	4	9.2	17	39.5
MIDDLE ATLANTIC:																					
New York	1,573,968	12,475	1,586,443	306	5.4	222	72.7	69	27.4	15	27.8	34	11.1	14	4.6	247	82.1	54	17.9	141	46.8
New Jersey	347,486	2,070	349,556	60	1.1	46	76.7	11	24.5	3	20.0	3	5.0	1	1.7	53	77.9	15	22.1	9	13.2
Pennsylvania	1,308,360	13,615	1,321,975	226	4.0	154	67.4	60	32.9	12	27.3	22	9.8	12	5.3	162	78.7	44	21.2	48	23.3
SOUTH ATLANTIC:																					
Delaware	34,050	265	34,315	13	0.2	9	69.3	3	42.9	1	16.7	0	0.0	2	15.4	4	40.0	6	60.0	0	0.0
Maryland	190,523	1,000	191,523	45	0.8	35	77.8	7	20.6	3	27.3	4	8.9	2	4.4	26	70.3	11	29.7	10	27.0
Dist. of Columbia	90,000	0	90,000	3	0.0	2	66.6	1	33.4	0	0.0	0	0.0	0	0.0	3	100.0	0	0.0	0	0.0
Virginia	167,941	0	167,941	92	1.6	84	91.3	6	8.3	2	10.0	5	5.4	1	1.1	79	79.8	20	20.2	36	36.4
West Virginia	347,382	4,238	351,620	64	1.1	48	75.1	15	26.4	1	14.3	4	6.3	3	4.7	48	87.3	7	12.7	7	12.7
North Carolina	218,312	2,805	221,117	140	2.5	103	73.5	15	19.5	22	35.0	7	5.0	10	7.2	58	47.9	63	52.1	43	35.5
South Carolina	395,694	1,125	396,819	72	1.3	62	86.2	4	9.3	6	20.7	3	4.2	6	8.3	44	60.3	29	39.7	33	45.2
Georgia	243,853	6,865	250,718	152	2.7	124	81.5	7	14.0	21	20.6	8	5.3	10	6.6	42	29.2	102	70.7	28	19.4
Florida	73,270	50	73,320	78	1.4	72	92.1	4	8.8	2	6.3	1	1.3	2	2.6	59	64.8	32	35.2	3	3.3
EAST NORTH CENTRAL:																					
Ohio	1,094,698	3,735	1,098,433	271	4.8	189	69.7	49	31.0	33	29.2	18	6.6	6	2.2	121	51.8	113	48.2	18	7.7
Indiana	368,518	4,595	373,113	199	3.5	135	67.9	44	34.9	20	27.4	6	3.0	4	2.0	90	55.2	73	44.8	12	7.4
Illinois	959,464	2,350	961,814	247	4.4	184	74.3	56	34.7	7	8.1	16	6.5	5	2.0	169	66.3	86	33.7	15	5.9
Michigan	712,197	427	712,624	190	3.4	174	91.8	12	11.9	4	4.4	11	5.8	3	1.6	128	59.0	89	41.0	115	52.9
Wisconsin	389,155	13,624	402,779	267	4.8	191	71.6	43	25.1	33	34.4	24	9.0	22	8.2	130	57.5	96	42.5	118	52.3
WEST NORTH CENTRAL:																					
Minnesota	288,252	10,879	299,131	219	3.9	167	76.3	21	21.4	31	25.6	17	7.8	14	6.4	78	39.2	121	60.8	39	19.6
Iowa	296,481	1,763	298,244	224	4.0	155	69.3	40	30.1	29	31.5	18	8.0	9	4.0	123	57.3	92	42.7	30	14.0
Missouri	396,327	1,584	397,911	234	4.2	189	80.8	34	21.2	11	14.9	13	5.6	4	1.7	124	62.7	74	37.3	5	2.5
North Dakota	24,299	1,134	25,433	119	2.1	117	98.5	1	1.0	1	4.4	1	0.8	3	2.5	103	80.5	25	19.5	0	0.0
South Dakota	30,529	231	30,760	112	2.0	104	92.8	6	8.1	2	5.3	1	0.9	2	1.8	72	65.4	38	34.6	7	6.4
Nebraska	111,076	1,030	112,106	251	4.5	203	80.9	16	14.9	32	22.2	4	1.6	6	2.4	82	36.3	144	63.7	32	14.2
Kansas	148,963	744	149,707	260	4.6	202	77.8	16	18.4	42	24.3	16	6.2	5	1.9	37	17.6	173	82.4	14	6.7
EAST SOUTH CENTRAL:																					
Kentucky	109,408	75	109,483	111	1.9	100	90.2	9	10.2	2	8.7	2	1.8	1	0.9	96	80.6	23	19.4	0	0.0
Tennessee	171,730	550	172,280	92	1.6	81	88.1	10	16.9	1	3.0	8	8.7	2	2.2	58	63.8	33	36.2	21	23.1
Alabama	173,318	19,600	192,918	62	1.1	55	88.8	2	6.6	5	15.6	5	8.1	2	3.2	32	49.9	32	50.1	12	18.8
Mississippi	42,888	0	42,888	93	1.6	93	100.0	0	0.0	0	0.0	1	1.1	1	1.1	40	42.6	54	57.4	0	0.0
WEST SOUTH CENTRAL:																					
Arkansas	58,418	859	59,277	82	1.5	74	90.3	7	11.1	1	5.3	2	2.4	4	4.9	67	77.8	19	22.2	2	2.3
Louisiana	87,674	0	87,674	67	1.2	64	95.6	3	9.1	0	0.0	1	1.5	1	1.5	30	46.9	34	53.1	0	0.0
Oklahoma	102,403	1,925	104,328	156	2.8	151	96.8	1	1.4	4	4.7	3	1.9	0	0.0	79	47.8	86	52.2	2	1.2
Texas	229,637	4,147	233,784	240	4.3	225	93.8	12	5.7	3	10.7	8	3.3	2	8.3	229	89.1	28	10.9	13	5.1
MOUNTAIN:																					
Montana	227,791	0	227,791	58	1.0	52	89.6	6	11.5	0	0.0	0	0.0	1	1.7	61	91.0	6	9.0	27	40.3
Idaho	121,160	0	121,160	39	0.7	28	71.8	7	22.6	4	50.0	7	17.9	1	4.3	46	85.1	8	14.9	39	72.2
Wyoming	21,699	0	21,699	34	0.6	34	100.0	0	0.0	1	14.3	0	0.0	5	14.7	31	81.6	7	19.4	7	18.4
Colorado	136,605	0	136,605	64	1.1	53	82.8	10	20.4	1	7.5	6	9.4	0	0.0	58	79.4	15	20.6	31	42.4
New Mexico	10,506	0	10,506	27	0.5	26	96.4	1	4.3	0	0.0	0	0.0	0	0.0	23	85.2	4	14.8	5	18.5
Arizona	58,439	0	58,439	30	0.5	23	76.8	5	18.5	2	66.7	2	6.7	0	0.0	28	90.3	3	9.7	10	32.3
Utah	85,380	0	85,380	36	0.6	30	83.3	3	15.8	3	17.7	4	11.1	0	0.0	41	70.7	17	29.3	54	93.2
Nevada	22,350	0	22,350	12	0.2	10	83.3	1	9.0	1	100.0	1	8.3	1	8.3	16	94.1	1	5.9	9	52.9
PACIFIC:																					
Washington	416,278	0	416,278	86	1.5	59	68.6	19	26.8	8	53.3	10	11.6	3	3.5	77	83.8	15	16.2	57	62.0
Oregon	144,708	0	144,708	58	1.0	55	94.9	2	4.4	1	7.7	5	8.6	1	1.7	57	81.4	13	18.5	57	81.5
California	978,423	0	978,423	83	1.5	48	57.8	22	35.0	13	65.0	12	14.5	2	2.4	115	85.3	20	14.7	90	66.7

Rating of Generators in Central Stations Totals 14,466,915 Kw.

Analysis of Central-Station Development Indicates a Total of 5,532 Electric Generating Plants, of Which Almost 65 per Cent Are Privately Owned—Hydro-Electric Plants Total 1,421



HOW THE VARIOUS SECTIONS OF THE COUNTRY COMPARE IN INSTALLED GENERATOR RATING

ON OCT. 1, 1921, there were 5,532 central generating plants in the United States, with a total installed generator rating of 14,466,915 kw. The total installed generator rating of the central stations in 1902 was only 1,212,200 kw., indicating an increase during the nineteen-year period of 1,092 per cent. The increase during the period from Jan. 1, 1920, to Oct. 1, 1921, was 1,706,015 kw., or at the rate of 7.6 per cent per annum. This yearly increase is about 2.2 per cent below that reported for 1919.

Detailed data on the central generating plants of the country will be found in the accompanying table. A similar analysis covering the period from 1902 to 1919, inclusive, appeared in the Aug. 14, 1920, issue of the ELECTRICAL WORLD. These data have been based almost entirely on reports submitted in connection with the preparation of the 1921 McGraw Central Station Directory and Data Book.

RESERVE EQUIPMENT TOTALS 169,577 KW.

The rating of the generators actually operating was reported as 14,279,338 kw., and the amount of reserve generator equipment was given as 169,577 kw. The indications are, therefore, that of the total generator installation in the central generating plants of the country almost 99 per cent is actually operating. The New England States reported by far the largest installation of reserve generator equipment, with 55,817 kw., or 4.2 per cent of the total generator installation of that section. No company in the Mountain or Pacific States reported reserve equipment. It appears from the reports received that the amount of reserve equipment in the various sections is largely dependent upon the growth of interconnection and the elimination of small generating plants in favor of some large central generating stations.

Of the 5,532 operating stations in the United States, almost 65 per cent are privately owned. The Pacific States show the largest percentage of privately owned plants, with 83.8 per cent, and the West North Central States reported the largest percentage of municipal generating plants, with 51.8 per cent.

Although the East North Central States record the largest number of hydro-electric plants, yet of central generating plants hydraulically operated in whole or in part, the Pacific States had 68.7 per cent. In the West South Central States 97 per cent of the plants are other than hydraulic.

There are 5,624 operating companies in the United States, of which almost one-quarter are serving communities in the West North Central States. The three Pacific States report only 227 operating companies, or about 4 per cent of the total reported for the whole country.

New York State reports the largest number of operating companies with 306, or more than either the Mountain or Pacific sections. Ohio is second with 271 operating companies. California presents an unusual situation, however, in that while standing twenty-fifth in the number of operating companies, the rating of the installed generators is exceeded only by New York, Pennsylvania and Ohio. A similar situation pertains to several other Western states.

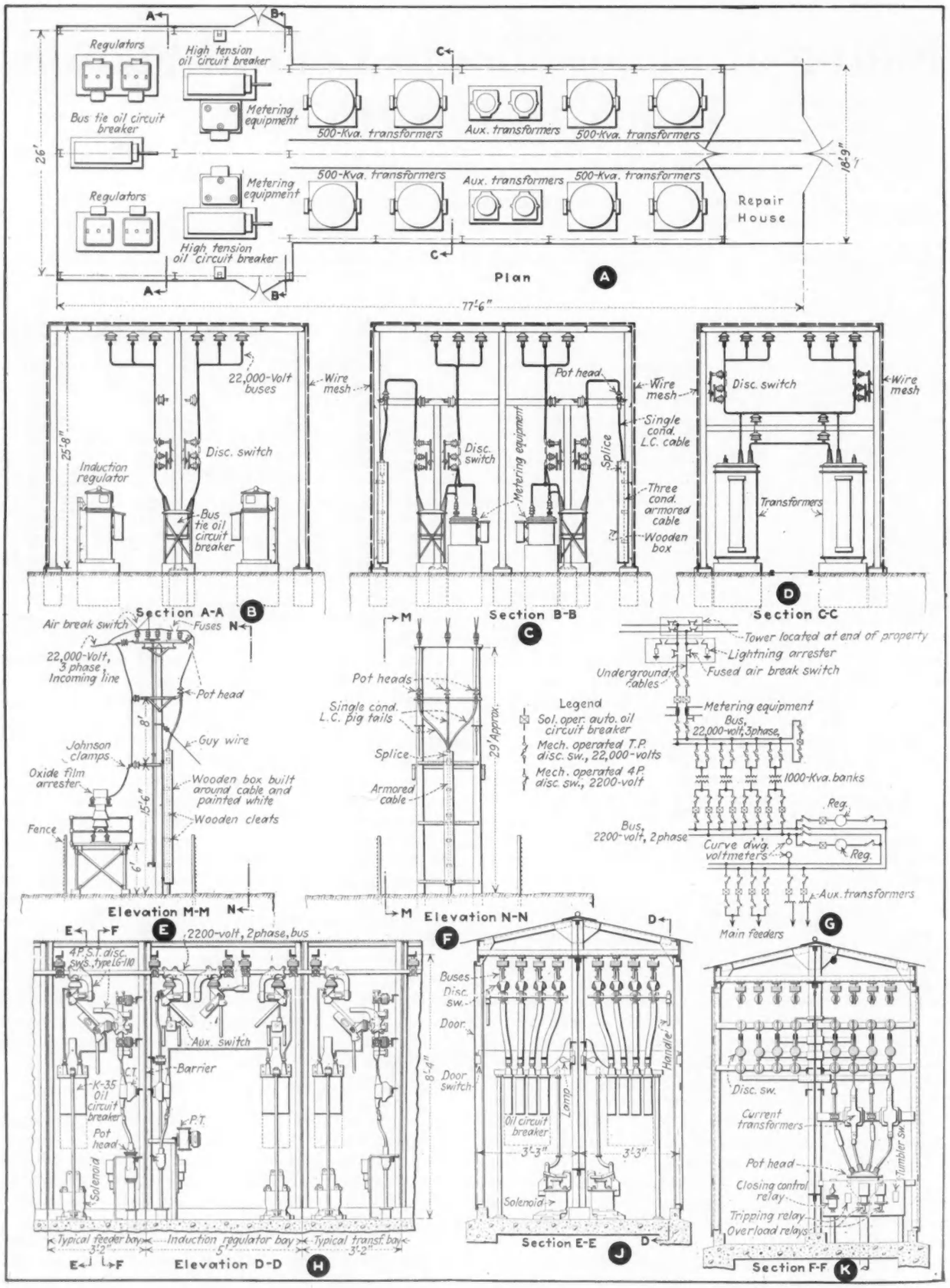
Almost 95 per cent of the operating companies in the West South Central States generate all or a portion of their energy. On the other hand, only 65.2 per cent of the companies in New England generate all or a portion of their own energy, Rhode Island reporting the lowest percentage—33.3.

TWENTY PER CENT OF PLANTS PURCHASE ENERGY

More than 20 per cent of the private and municipal companies purchase all their energy for resale, that is, do not generate any energy at all. This is most pronounced in the New England States, where over half of the municipal companies merely act in the capacity of distributing companies.

There are 193 companies purchasing energy and having reserve equipment. To a large extent these are small companies which have been purchased by large operating and distributing companies, the purchasing company supplying the old company with energy from the central generating plant and the old equipment in the local plant being left standing as reserve.

Construction Features of Outdoor Substation Serving Rocky Point Radio Station



A — Mechanically operated disconnecting switches make this outdoor station compact and safe. B—Section across the bus tie, circuit breaker and regulator. C—Section across high-tension oil circuit breakers and metering equipment. D—Section across a bus with which transformers are connected. E and F—Dead-end structure where overhead lines connect 25,000-volt underground armored cables. G—Simplified connections of equipment in the outdoor station. H, J and K—New type of 2,300-volt outdoor steel bus structure made possible by use of new types of mechanically operated disconnecting switches.

Safe, Simple and Compact Construction

Stereotyped Construction Is Avoided—Overhead Service Terminates at a Distance from Station, Which Is Entirely Covered with Wire Mesh—Underground Circuits to and from Station—Steel Housing for 2,300-Volt Equipment

By M. M. SAMUELS
The J. G. White Engineering Corporation

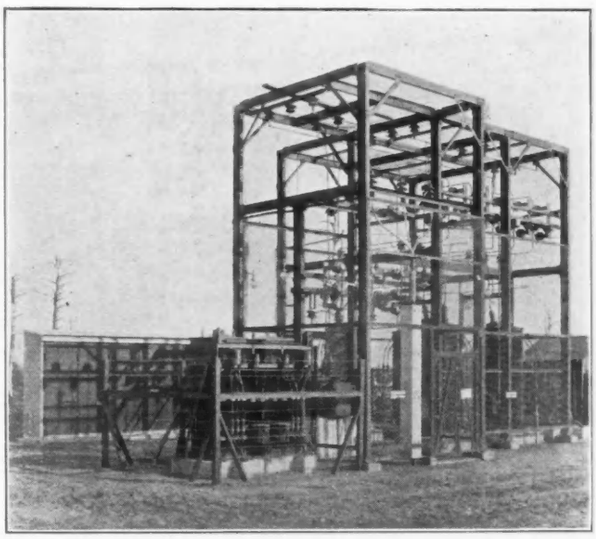
COMPACT and simple substation construction that does not sacrifice safety was employed in serving the Rocky Point (Long Island) receiving station of the Radio Corporation of America, many features of which may be incorporated to advantage in other outdoor stations. It is particularly interesting because a departure has been made from the usual stereotyped construction. Owing to the possibility of the electric service equipment interfering with radio reception, the 22,000-volt transmission line serving the station is not carried directly to it, but is terminated about 1,300 ft. (395 m.) away, the circuits to and from the substation consisting of underground cables. In addition, all of the station electric equipment is electromagnetically shielded.

The overhead terminal structure consists of a two-pole dead-end on which are mounted fused air-break switches, one side being connected to the open-wire circuits and the other side to the underground cable leading to the substation. Instead of using one triple-conductor pothead three single-conductor units were employed, a short length of single-conductor cable being wiped on each pothead and the three single cables spliced and wiped on the three-conductor underground cable. This construction made it possible to allow more clearance between the junction points of the underground and overhead circuits. To protect the compound in the cable above ground from the sun's rays and at the same time allow ventilation, a wooden box painted white was built around the vertical run of cable. Next to the dead-end poles on a steel platform are oxide-film lightning arresters which are connected to the open-wire circuit by Johnson clamps. Attachment is facilitated by specially designed yokes on the insulators. The entire dead-end structure is surrounded by a barbed-wire fence.

The underground cable running from the overhead terminal to the substation is armored with steel tape and rated at 25,000 volts but tested for 62,500 volts. It was laid in an open trench in two lengths with a splicing box in the middle of the run. The cable was placed 3 ft. 6 in. (1.06 m.) below the ground level. At the substation end the underground cable was brought up to the open-wire circuits in the same manner.

The substation, which is in close proximity to the radio power house, is laid out for an ultimate installation of four banks of transformers, each bank rated at 1,000 kva. and connected in T to give 2,200 volts, two-phase, on the secondary. In the future there will be two sets of high-tension buses, each bus to be supplied from one transmission-line circuit and equipped with a high-tension oil circuit breaker, but at present there is only one high-tension bus and there are no high-tension oil circuit breakers. The metering is accomplished by means of an outdoor-type equipment in the line circuit.

The high-tension substation structure is of a peculiar character, there being no overhead outgoing lines and no lightning arresters or choke coils, both high-tension and low-tension circuits leaving the station underground. As in most outdoor substations, the design of this station was primarily determined by the type and arrangement of the disconnecting switches. All disconnecting switches are mechanically operated from the ground, the switch bases being mounted in vertical planes with insulator axes horizontal, thus eliminating complicated, cumbersome and topheavy 45-deg. mountings. This arrangement may now be considered perfectly safe since sufficient test reports have been made available to prove that a pin insulator in the horizontal position has virtually the same flashover value as one in upright position or inclined 45 deg. The high-tension buses and connections are made of ½-in. (12.7-mm.) copper pipe, eliminating all loose and unsightly wiring and strings of strain insulators. The insulators used on the disconnecting switches, air-break switch and bus work are interchangeable and rated at 35,000 volts.



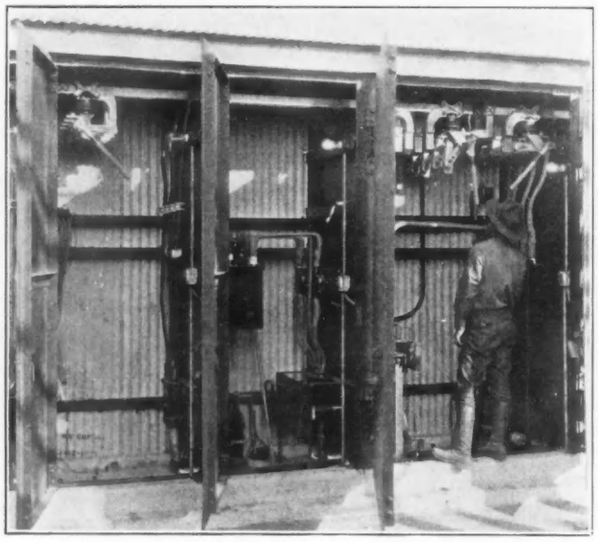
COMPACT AND SAFE OUTDOOR SUBSTATION MADE POSSIBLE BY MECHANICALLY OPERATED DISCONNECTING SWITCHES

Compactness, simplicity and safety were the underlying requirements in the design of this station. Space was very valuable, both floor space and height, for the reason that the whole station had to be covered with wire mesh. Despite the compactness of the design, a maximum of safety was attained, there being no energized parts within reach from the ground. The necessity of swinging switch sticks was eliminated by the use of mechanisms on all disconnecting switches. The steel uprights consist of small I-beams, and all cross-members are single channels or angles, there being neither lattice poles, heavy trusses nor diagonal tie-rods.

The transformers are arranged in two rows, one

transformer of each bank being on one side of the aisle and the other on the other side, with a track between for moving the apparatus to a repair house.

On account of the double-row arrangement of transformers, floodlighting could not be employed for properly illuminating the apparatus and the operating aisle, so bracket fixtures were provided instead. These were made of 1-in. (2.54-cm.) pipe and fittings and equipped with Benjamin waterproof globes, No. 1555, which are well adapted for properly distributing the lighting and for throwing sufficient light upward to illuminate the buses and insulators without giving excessive glare. A



2,300-VOLT OUTDOOR STEEL BUS AND SWITCH STRUCTURE

number of heavy receptacles were also provided for the purpose of attaching hand portables.

Providing for the 2,300-volt switching equipment presented more difficulty than did the high-tension circuits because it was not considered desirable to house it within the radio power station and because the expense of erecting a separate building for it did not seem to be warranted. Although complete lines of outdoor apparatus are available for use on high-voltage circuits, no suitable outdoor apparatus, such as oil circuit breakers, current and potential transformers, etc., have as yet been developed for 2,300 volts. The only way in which such apparatus had been installed satisfactorily outdoors up to this time was to build separate oil-switch houses, each with eight waterproof bushings, provide separate waterproof boxes for current and potential transformers, and in addition erect an open structure for disconnecting switches and bus work. In this case everything would have to be covered with screening, an arrangement which would have been both unsightly and expensive. Fortunately, a new type of disconnecting switch, the LG-110, had just been made available by the General Electric Company, and this made it possible to place all the 2,300-volt apparatus and wiring in a small and simple steel housing. The expense of housing the complete switching equipment in this manner was not much more than would have been required for housing one oil circuit breaker with its eight bushings. Besides the construction employed eliminates the necessity of open structures for buswork.

The LG-110 disconnecting switch consists of one insulator per pole clamped to the bus. The clamp which carries the insulator is extended in the shape of a horn carrying the switch clips, which are thus made part of the bus. The blade and hinge are attached to the bottom of the insulator. The four blades of the four disconnecting switches of a two-phase circuit are tied together by a square steel shaft covered with insulating material. A grounded metal handle is attached to one end of the shaft to operate the four switches simultaneously. Auxiliary switches can be added on the shaft for operating signal lights or for interlocking.

The steel house for the 2,300-volt equipment was built in the style of a bus structure, the compartments merely containing the apparatus and wiring with no space for operators, the operation being performed from the outside. A steel door guards each circuit, and a steel barrier is provided between circuits, except along the top of each section, to provide a passageway for the bus. All the oil circuit breakers are solenoid-operated and are controlled from a panel in the radio power station. In each tripping circuit is a relay which makes the circuit independent of the bell-alarm relay. A small tumbler switch is installed in the closing control circuit for the purpose of disconnecting it when working on an oil circuit breaker. All the overload relays, tripping relays, operating relays and tumbler switches for each circuit are arranged on a single steel plate mounted on one side of each compartment. Illumination is provided in each compartment with door-switch control.

The structure consists of an angle-iron framework made of 2½-in. x 2½-in. x ¼-in. (6.35-cm. x 6.35-cm. x 6.35-mm.) angles and is covered with No. 24 gage galvanized corrugated iron. The barriers between circuits are No. 12 gage sheet steel, and the doors are made of 2½-in. x 2½-in. x ¼-in. angle frame and No. 12 sheet steel.

To the best of the writer's knowledge, this type of outdoor 2,300-volt bus structure is being used here for the first time. It seems to offer great possibilities for further development, even though it is not at all suitable for large-capacity installations, where each phase must be in a separate compartment.

A bank of induction feeder regulators is provided in the 2,300-volt bus between transformers and feeders. These regulators are situated within the inclosure of the outdoor substation and are supplied from the 2,300-volt switch house through an automatic oil circuit breaker by underground cables. By means of disconnecting switches the regulator can be disconnected and the service continued without regulation.

Red and green indicating lamps are provided on all high-tension apparatus, such as transformers, regulators and metering equipment, to indicate whether or not the particular piece of apparatus is energized from either side. These lamps are operated by auxiliary switches on the mechanisms of oil circuit breakers or disconnecting switches.

All control circuits from the radio power station are carried in one multiple-conductor cable containing nineteen No. 22 wires. This cable terminates at the substation in a box containing a slate panel with connecting lugs, from which smaller cables are distributed in iron conduit to the various circuits.

The whole distribution system is underground, the cables being carried in fiber conduits through a series of manholes, in which they are suitably supported, and protected by means of "brick lath" and cement. An interesting feature of the underground system is that all cables run straight through the manholes, there being no bends, offsets or loops, since all offsets are made beyond the manholes by means of fiber bends.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

The Automatic Station Represents Distinct Advance in Distribution

To the Editors of the ELECTRICAL WORLD:

The subject of automatic stations has been considered in your publication from time to time, but the new situation which has been created by this development has not, in my opinion, been sufficiently emphasized.

The automatic station represents a distinct advance in the art of electrical distribution. Installation of these stations on existing systems will effect economies which in some cases will be startling. In fact, it is the belief of those who have studied the situation that the automatic station is the greatest single advance in electrical distribution since the displacement of the series-arc system by the multiple incandescent system.

At first sight the automatic station may appear a little complicated and mysterious because it operates without an attendant. However, when it is considered that an automatic station is merely a simple combination of well-known devices which have been in use for many years, the feeling of mystery disappears. Moreover, when it is realized that these stations are installed and maintained by the usual type of electrician found on all power systems, the idea of complexity disappears.

Being electrically operated, the various devices which have been incorporated in an automatic switching equipment make the operation of a station very much safer than when an operator is depended upon to do the various tasks. There is not the possibility of a device hesitating a fraction of a second to think what it should do, as would be the case with an operator. Instead of that it is adjusted to operate under a certain set of conditions, and experience has demonstrated that it will virtually always operate in response to these conditions. Everybody recognizes that the overload coil on a circuit breaker gives protection which could not be given by an attendant. Its use has been widely extended by the application of discriminating relays, so that practically every large power system is today operating with automatic system protection. In this manner the entire development of the electrical art may be traced step by step until the culmination is found in the complete automatic station.

Among the principal features of automatic stations, one which has only been partly realized during the past few years has been the possibility by its economic location of remarkably improving distribution voltages as well as reducing power losses. The automatic station requires no attendant and may be made in single units; consequently it may be smaller in size and installed nearer the economic load centers of the system. It can be frequently located on relatively inexpensive sites and the buildings may be of the least expensive design. As a result it is relatively easy to maintain a more uniform distribution pressure than with manual equipments for the same initial investment.

A number of large lighting and power organizations have been making studies of the application of automatic stations to their systems. The results have been very illuminating. They showed that in general the cost of the automatic equipment could be balanced by the saving in power and operating expense during the first eighteen months after the stations were installed. Besides, a very much higher grade of service could be rendered and the saving in power and operating expense after the initial period would appreciably increase the net earnings.

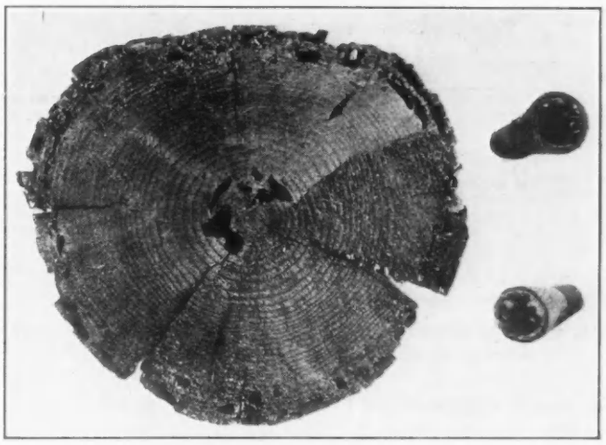
The result of many surveys indicates that practically all systems could advantageously be completely, but gradually, rehabilitated on the basis of automatic operation. This, together with an inexpensive supervisory control system, would effectively reduce operating expense and increase service efficiency.

General Electric Company, Schenectady, N. Y. CHESTER LICHTENBERG, Engineering Department.

Termites Invade California and Destroy Poles, Cross-Arms and Pins

To the Editors of the ELECTRICAL WORLD:

Until quite recently this country has been unusually free from the ravages of termites, or white ants. But it has been discovered on the system of the Southern California Edison Company that not a few of the untreated cedar poles set along the coast north from San Diego, and even inland for 50 miles, have been attacked by these pests and partly or wholly destroyed. In some



METHOD BY WHICH WHITE ANTS ATTACK CEDAR POLES AND INSULATOR PINS

instances the destruction has extended to the cross-arms and even to the insulator pins. The ants work up from the ground or from below the ground surface and honeycomb the entire interior. The damage is not disclosed by a casual inspection, but when rapped with a metal bar the surface will give way and the ravages of the insects will be seen. Systematic inspection has indicated that creosoting will prevent penetration by termites, and as this has been a general practice for several years past the total damage will not be great.

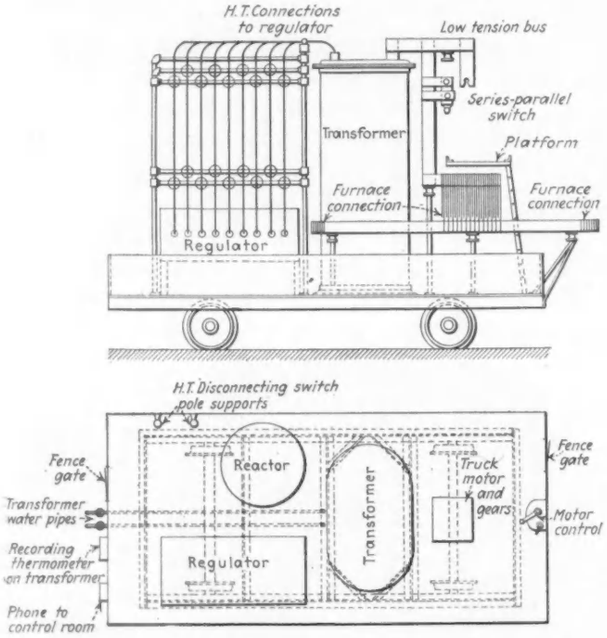
R. E. CUNNINGHAM,
Superintendent of Distribution.
Southern California Edison Company,
Los Angeles, Cal.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Furnace Transformer Mounted on Truck to Save Running Heavy Leads

IN ORDER to save running a large number of heavy connections to feed several electric furnaces, a certain plant has mounted the furnace transformer on a truck which can be placed close to any of the furnaces. By this arrangement only short secondary leads are required. The primary 13,200-volt leads are run to a point near each furnace, but these leads are comparatively small and inexpensive. This transformer equipment has



THIS ELECTRIC FURNACE EQUIPMENT IN SERVICE 92 PER CENT OF THE TIME DURING THE PAST FOUR YEARS

been in service on an average of 92 per cent of the time during the last four years. Generally speaking the equipment is giving more satisfactory operation than stationary equipment would give. The expense attached for inspection, cleaning, maintenance and general repair has been about equal to that for a corresponding stationary layout exclusive of its busbar system. The maintenance of the latter system represents considerable expense which is absent with the present installation.

About four years ago it became necessary to increase the capacity of this plant by adding a 2,000-kva. single-phase transformer unit for service with electric furnaces. The policy previously followed when installing an equipment of this kind had been to erect the transformer and auxiliary apparatus in a convenient location and carry out a long heavy copper busbar for the low-tension connection to the furnaces. However, at this time, on account of the very high cost of copper and the long time required for delivery, other types of construction were discussed. The transformer was rated at 2,000 kva. and 13,200 volts primary and 50/200 volts secondary. It was intended to serve any one of ten or twelve electric furnaces. The furnaces were set in two rows with ends toward a center aisle. After considering all the costs in the matter, it was decided to build a four-wheel motor-driven truck to travel on tracks in the aisle between the furnaces. On this truck were mounted the transformer, switching reactor and regulator.

On the high-tension side a cable bus was placed on insulators and connected to disconnecting switches, which were placed near the tracks, where the transformer truck could stop and connection readily be made. The low-tension connections to the furnaces were also placed in convenient locations near the tracks. Water connections for cooling the transformer were made by means of flexible pipes similar to the air couplings used on trains. It was necessary to carry a control cable of more than twenty wires for the operation of the motor-driven regulator, signal equipment and safety devices. In all of these connections it was necessary so to design the equipment as to make it impossible to connect in any but the proper way and to facilitate connecting and disconnecting in as short a period of time as possible.

Compact Truck Equipment

The general layout of the truck is shown in the accompanying illustration of the floor plan. This truck is built of steel framework, with a hard-pine plank floor, and has a protecting fence made of asbestos lumber, placed on a wooden frame, with a gate in each end. This fence is equipped with safety switches which are connected to a no-voltage release on the main oil circuit breaker, so that should any person attempt to enter the inclosure after the transformer is placed in operation the high-tension voltage would be automatically cut off. The switchboard panel, with the main control for the transformer, is installed in a control room where all power control is centered. The main oil circuit breaker for the truck is automatic, with overload and under-voltage relays. From this 13,200-volt breaker a lead-covered feeder extends underground to the insulated cable bus. The bus is mounted on the building's steel frame, and the jaws of disconnecting switches are placed at the several stations where the truck stops to connect up for operation. The blades of the disconnecting switches are mounted upon treated poles carried on the truck so that the blades may be readily connected in the switch jaws when the truck stops at a position to feed a furnace. The switch blades have attached to them a short section of flexible cable that connects with the high-tension bus on the truck. They have also an interlocking device so that the truck motor circuit is open when the disconnecting switches are closed, preventing the motor from being started when the connections are made for operation.

The cable for the control of the regulator, which also carries the wires for the safety devices, temperature

alarm and telephone, is brought from the switchboard panel in the control room along the steel frame of the building and at each operating station terminates on an alberene stone slab, mounted on a rigid steel box. The slab is provided with twenty-four low feeder-plug receptacles arranged in a triangle and connected to the main control cable. The plug carried on the truck connecting to this slab is made of a cast-aluminum shell with a sheet bakelite face which carries the twenty-four plugs arranged to fit in the twenty-four receptacles on the panel at each operating station. The plug has a flexible section of control cable attached to it and carries an interlock for the truck motor circuit to prevent operation of the truck with the plugs in operating position.

RIGID BUS CONSTRUCTION

The high-tension cable connections from the regulator and switching reactor to the transformer are standard-practice 13,200-volt construction, mounted on a pipe frame and braced so as to be held rigid against the movement of the truck. The conductors from the low-tension side of the transformer are built up of ⅜-in. x 6-in. copper and will safely carry approximately 40,000 amp. This is the highest current the transformer is called upon to deliver at the lowest operating voltages. The secondary bus extends from the transformer through the series paralleling switches to the point where the connections are made to the furnace buses at each operating station. The furnace connection is made by inserting a 1-ft. section of busbar between the truck bus and the furnace bus. This section is drilled for a through bolt, which makes a very rigid and tight connection when the bolt is drawn tight. The series paralleling switches are made of ⅜-in. x 7-in. busbar, arranged for two-pole double-throw through an arc of 90 deg. The top jaws are made to tie the proper ends of each pair of coils in series so as to connect in series the low-tension-transformer coils in pairs, while the lower jaws are arranged to connect the transformer coils to the main buses, all in parallel. The jaws of this switch are slotted to receive a through bolt carried by the switch blade, which is insulated by means of a bakelite tube and bakelite washers under the nut. When the switch is in place a positive contact is assured by drawing up this bolt.

ALFRED L. WILLIAMS,
Niagara Falls, N. Y. Consulting Engineer.

Safeguarding Repair and Construction Work on Electrical Circuits

A LARGE percentage of the accidents which occur to linemen and electricians are due to turning the power on before the men are off the line or to the men starting work on a supposedly dead line from which the power has not been cut off. Probably the most common source of trouble arises where the station operator receives orders from more than one person relative to a shutdown on the same circuit. The following set of rules governing shutdowns, which has been compiled from the general instructions of several comparatively small operating companies, has been found very serviceable on transmission systems which are not extensive enough to require a load dispatcher:

1. All power and lighting circuits are to be considered alive by all persons concerned unless such persons have definite knowledge to the contrary.

2. Power must not be cut off from any circuit until requested by the person in immediate charge of the work which necessitates the shutdown. The request shall be made either in person or by telephone by one person only, who shall give his name and indicate the line he wishes to work on. He must then wait until the station operator informs him that the power is off the line.

3. When the station operator receives an order to cut the power off a certain line, he must open the disconnecting switches between the bus and the oil circuit breaker, as well as the circuit breaker, and must place a danger tag on the latter. He must also attach a tag indicating the name of the party ordering the power off, and the time. After this has been done he shall advise the person desiring the shutdown that the power is off the line.

4. The person in charge of the work must see that the lines are shorted and grounded before work is commenced.

5. After the work has been completed, the person in charge of the work who made the request for the shutdown shall call the station operator, give his name, and shall plainly state that the work is completed, that the men are off the line, and shall order the power turned on. He shall then wait until the operator tells him the power is on the line and shall then test out the apparatus on this line to see that everything is in good working order before leaving the job.

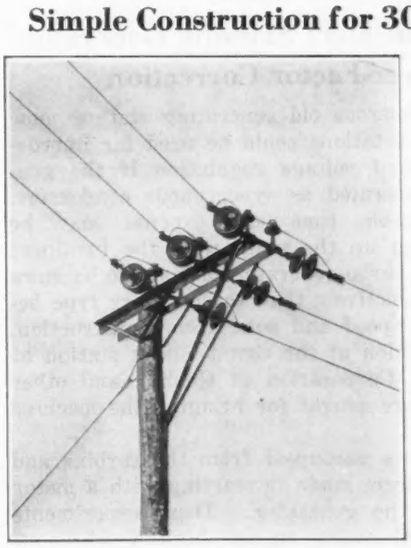
6. The station operator shall record all power interruptions on his daily log sheet in full, the name of the person ordering the power off and on, the line involved and the time of shutting off and turning on the power.

7. When two or more jobs are being done on the same line at the same time and one man is in charge of each job, one man only may assume responsibility for ordering the power off and on, and the station operator shall not accept orders from more than one person relative to the same shutdown.

8. In case of emergency where life or property is endangered, any one may interrupt the power service by giving his name and the reason for cutting the power off, but where there is no urgent necessity arrangements must be made through the office of the superintendent long enough in advance to give all parties affected time enough to prepare for the shutdown.

A. L. JOHNSTON,
Manager Electrical Department.
H. C. Felver, Engineering & Contracting,
Pottsville, Pa.

Simple Construction for 30-Deg. Turn



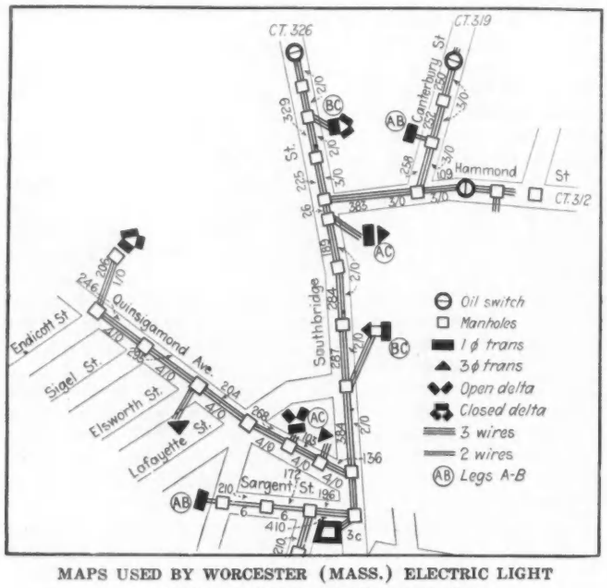
CONDUCTORS DEAD-ENDED AT OFFSET CROSSARM

A SIMPLE method of making a 30-deg. turn in a three-phase high-voltage line is shown in the illustration. Only one pole with a head guy bisecting the angle in the line is used. At the top is an offset crossarm made of angle irons braced at their outer ends. The circuits are dead-ended to this arm, short jumpers supported by pin-type insulators carrying the circuits over the arm. The construction is rigid and simple and so far has given no trouble. The turn is in a circuit of the Blackstone Valley (R. I.) Gas & Electric Company, feeding a large textile factory.

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Loose-Leaf Prints of Circuits Help Distribution Force

BY USING appropriate symbols and keeping the original tracings up to date the distribution force of the Worcester (Mass.) Electric Light Company is supplied with excellent maps of individual circuits in the form of 8-in. x 10.5-in. blueprints of the loose-leaf type. On these easily can be shown the size of wire, number of phases, type of transformer connections installed and



MAPS USED BY WORCESTER (MASS.) ELECTRIC LIGHT COMPANY FOR DISTRIBUTION SYSTEM

phase wires off which single-phase taps are taken, distance between manholes in feet and location of manholes and transformers, position of oil switches, etc. George M. Hardy is superintendent.

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Finding Way to Start Standby Generators for Power-Factor Correction

NO DOUBT numerous old generating stations now serving as substations could be used for improving power-factor and voltage regulation if the generators could be operated as synchronous condensers. However, considerable time and expense may be involved in starting up the units with the turbines; and besides, steam turbo-generators are apt to be more difficult to start inductively than the ordinary type because of the high speed and solid rotor construction. This was the condition at the Grant Street station of the Public Service Corporation of Quebec, and other means were therefore sought for bringing the machine up to synchronism.

The generator was uncoupled from the turbine and some experiments were made in starting with a motor belt connected to the generator. These experiments were not successful owing to the high synchronous speed of the generator (3,750 r.p.m.) and to the difficulty in transmitting the necessary power by a belt.

Later on the writer conducted some tests to determine the feasibility of inductive starting. The first unit tested was a Curtis turbo-generator rated at 750 kw., 3,780 r.p.m., three-phase, 63 cycles, two poles, 2,300 volts, 236 amp. per phase, with directly connected exciter. The tests were made with the turbine uncoupled from the generator.

As a preliminary test a potential of 220 volts, three-phase, was applied to the stator winding with the field circuit open. The induced voltage in the field circuit caused the slip rings to flash over. The field circuit was then closed with the resistance of the field rheostat in series and 220 volts was again applied to the stator. When the rotor received a start it slowly accelerated and came up to half speed. It was not possible to run it above half speed by opening the field circuit or by introducing a high resistance.

Next two 50-kw., 2,300/550-volt transformers were connected in open delta to furnish 550-volt starting current. When this voltage was applied the machine accelerated quietly and promptly, but again locked at half speed. Arrangements were made to install additional starting transformers that would give 1,100 volts as a second starting tap. It was hoped that this voltage would cause the machine to break out of the half-speed position and come up to synchronism. However, this test was not carried out for the reason that about this time the turbine of another unit stripped its blading and it was necessary to couple the 750-kw. generator to its turbine and hold it ready for emergency service.

CHANGES THAT ENABLED STARTING

Later on it was decided not to repair the damaged turbine, but to operate its generator as a synchronous condenser. (This generator was rated at 1,000 kw., two-phase, 2,000 volts, 60 cycles, four poles, 1,800 r.p.m. It had been reconnected for three-phase operation by connecting an 87 per cent tap on one phase to the middle of the other phase, thus forming a T connection.) Arrangements were made to apply 550 volts for starting, from the two 50-kw. transformers used in the previous test. The field circuit was closed through the resistance of the field rheostat. The initial current was over 600 amp., but this was not sufficient to start the machine. It was necessary to bolt on an extension shaft projecting out through the bearing housing, in order that a pipe wrench might be used to start the machine turning over. When this was done acceleration took place rather slowly, and synchronism was reached in from two to three minutes. A weak field was then applied and built up until the machine was taking a heavy leading current, when the starting switch was tripped out and the running switch thrown in. During this starting process the two 50-kw. transformers heated up considerably, and for this reason a third 50-kw. transformer was installed, forming a closed delta bank.

The machine proved to be quite stable when operating as a synchronous condenser. No trouble has been experienced with it in any way. When the synchronous condenser was put into service the induction regulator was put on hand control and the field of the synchronous condenser was controlled by a Tirrill regulator. The station attendant was instructed to set the induction regulator so that the synchronous condenser would be kept boosting at nearly full rating all of the time.

There were two buses in the station, the machine being connected to each bus by an oil switch. One of these was disconnected from the bus and connected as a starting switch to the 550-volt side of the transformers. Since the two hand-operated oil switches were

mounted side by side on the generator panel, it was an easy matter to provide a mechanical interlocking device. The starting transformers were phased out with the bus so that there was no disturbance in passing from the starting to the running position. C. R. REID,

Power House Superintendent.

Shawinigan Water & Power Company,
Shawinigan Falls, Quebec.

Relative Merits of Three Methods of Obtaining Heat Balance

THREE methods of supplying electrical energy for station auxiliary drive for obtaining a satisfactory heat balance and the relative advantages of each were outlined in a paper by H. C. Albrecht, electrical engineer the Philadelphia Electric Company, before a recent meeting of the New York Section of the A. I. E. E. and the Metropolitan Section of the A. S. M. E. These methods involve supplying energy from (a) the main generating units or main bus, (b) the house turbo-generators, or (c) a combination of both.

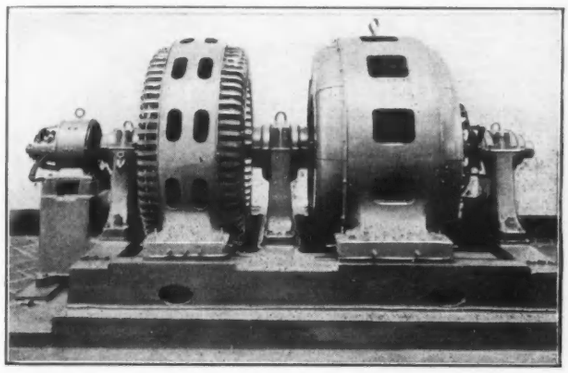
Some of the advantages of supplying energy from the main generating units or main bus through transformers are low investment costs, small space requirements and simplicity of operation as compared to supply from house turbo-generators. Great flexibility in obtaining heat balance is also possible by bleeding the main units, by use of steam drive or dual (steam-electric) drive for some of the large auxiliaries, or by combinations of these. With this scheme of energy supply, however, auxiliary equipment may be affected by disturbances on the main bus, due either to station or system troubles, and is subjected to more severe duty during short-circuit conditions than if isolated, although conditions may be modified somewhat by the installation of certain other equipment. Examples of this type of installation are the Chester and Delaware stations of the Philadelphia Electric Company and the Calumet station of the Commonwealth Edison Company.

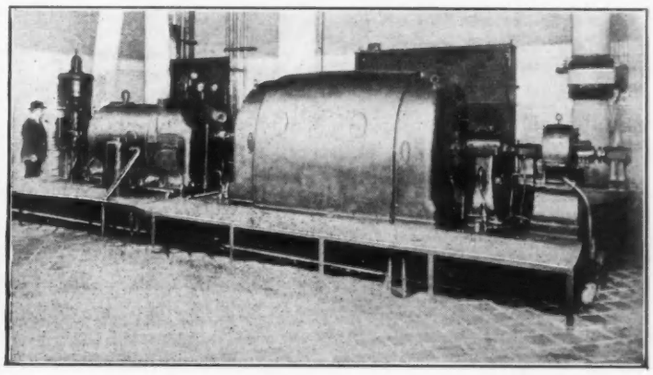
The house turbo-generator method of supply has the advantage of complete isolation from the main generating system and of lessened duty on equipment during system disturbances, with consequent greater reliability of service. However, this method is more costly, requires more space than the transformer method and affords less flexibility in obtaining heat balance.

A combination of supply from the main units or main bus and of house turbo-generators has the merits of both methods and also gives the additional distinct advantage of two independent sources of supply. Great flexibility can be obtained in the adjustment for heat balance, but more space and greater investment are required than when supply is obtained through transformers from the main units or main bus. This method also permits the connection of certain essential auxiliaries to the house turbo-generators, thus giving the advantage of greater reliability and assurance of continuity of service. This type of installation is used in the Colfax station of the Duquesne Light Company and in the Hell Gate station at New York.

Any of the methods of supply outlined above may be arranged so that the supply will be from a common system for all of the station auxiliaries. This has the disadvantage that an interruption in the service may affect all of the auxiliaries supplied from the common bus. It may also be supplied from a segregated system arranged for operation of several selected groups of auxiliaries. These may be chosen to include a portion of the boiler auxiliaries, all of the auxiliaries of an individual main turbine, those of a pair of turbines, or only certain auxiliaries from two or more turbines. The latter practice is of advantage when important motor driven auxiliaries are provided in duplicate.

New York, N. Y. FIELD EDITOR ELECTRICAL WORLD.





TWO IMPORTANT PARTS OF COLFAX HEAT-BALANCE SYSTEM

When the house generator on the right runs at the same frequency as the main generators, the motor-generator on the left will carry no load and the house turbine will carry all of the electrical station auxiliaries. By reducing the speed of the house turbine the motor-generator, which is driven from the main bus, can be made to pick up some of the auxiliary load, and the exhaust steam from the house turbine will be thereby reduced. Since the exhaust from the fans and feed-pump turbines is always less than required in both the feed-water evaporators and barometric-condenser type heater, the speed control of the house turbine can always maintain the desired heat balance. The motor-generator set is fed from the main generator bus.

Flexible Hose Used for Transformer Oil Piping System

THE oil-circulating type transformers of the Southern California Edison Company's Long Beach steam station have been installed with flexible metallic hose connecting the transformer cases with the rigid piping. By this means any slight inaccuracies in the placing of the transformers may be easily corrected, and in the event that it is necessary to replace a damaged unit with a spare transformer the connections may be made quickly. Standard 4-in. flexible hose is used having fire-hose connections on the ends.

FIELD EDITOR ELECTRICAL WORLD.

San Francisco, Cal.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

A Survey of Rural and Urban Dwellings in the United States

An Interesting Analysis Which Shows that the Number of Country Homes Exceeds Those in the Cities—Presenting a Large Problem for the Electrical Industry

FOLLOWING the analysis of home ownership throughout the United States as compiled by the Bureau of Housing under the Department of Commerce, which was published in this section of the ELECTRICAL WORLD, March 25, this comparison of the number of rural and urban dwellings is pertinent. The accompanying chart and table show conditions which have considerable significance to the electrical industry.

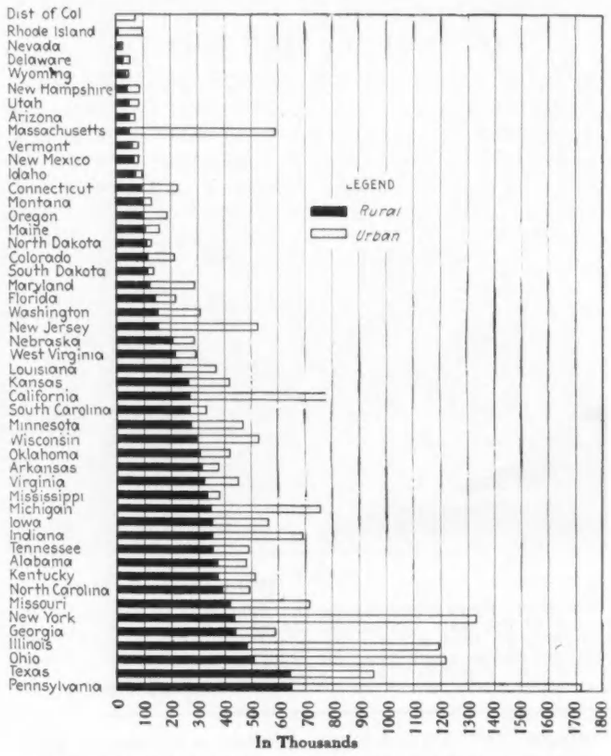
Of the forty-eight states only twelve have fewer rural than urban dwellings. These are Rhode Island, New Hampshire, Connecticut, Maryland, New Jersey, California, Michigan, New York, Illinois, Ohio, Washington and Pennsylvania. Obviously the excess of urban over rural dwellings occurs in those states having one or more large cities and it is particularly interesting to note that in New York, even with its large metropolitan districts, 32.8 per cent, or nearly one-third, of the total dwellings are rural. In Illinois with 1,190,414 houses in all, 483,602 or 43.2 per cent are rural. In Pennsylvania there are 649,665 rural or 37.6 per cent.

The New England States with the exception of Vermont and Maine have a higher percentage of urban than rural dwellings. This, of course, is accounted for by the concentration of industrial plants and comparatively limited amount of agricultural activity in this section.

The Central, Southern and Middle Western agricultural states show a much higher ratio of rural to urban dwellings, ranging from 51.3 per cent rural in Indiana to 87.5 in North Dakota. The Southern states average a high percentage of rural dwellings. The Western and Rocky Mountain states also have a high percentage of rural houses.

The total for the entire country shows that 11,212,652 or 54.1 per cent of the dwellings are rural. In 1910 there were 10,551,603 rural dwellings in the United States, which was 57.6 per cent of the total 17,805,845 urban and rural dwellings at that time. These figures show that the percentage of rural dwellings has decreased from 57.6 to 54.1, which would seem to indicate a decided exodus to the city. It should be remembered, however, that the 1920 census was taken at a time when industrial activity in the cities was at its height and country people generally were moving into town. During the past two years this movement has been checked and now there is a trend in the other direction.

The fact that more than one-half of the country's dwellings are located in rural communities indicates the size of the problem which the electrical industry faces. So far this market has scarcely been scratched and the rural customers' demand upon the industry will probably equal if not surpass that of the urban customers.



DISTRIBUTION OF RURAL AND URBAN DWELLINGS BY STATES

NUMBER OF RURAL AND URBAN DWELLINGS BY STATES AS REPORTED BY BUREAU OF CENSUS FOR 1920

	Rural	Urban	Total
Dist. of Col.	.....	72,175	72,175
Rhode Island	3,834	95,027	98,861
Nevada	17,368	3,341	20,709
Delaware	24,213	23,655	47,868
Wyoming	33,122	11,588	44,710
New Hampshire	40,728	51,456	92,184
Utah	46,325	43,262	89,587
Arizona	48,709	24,964	73,673
Massachusetts	49,156	547,896	597,052
Vermont	56,436	20,722	77,158
New Mexico	64,113	13,911	78,024
Idaho	69,913	25,386	95,299
Connecticut	93,204	135,201	228,405
Montana	94,535	36,135	130,670
Oregon	98,857	86,224	185,081
Maine	108,657	53,647	162,304
North Dakota	113,330	16,575	129,905
Colorado	115,199	95,904	211,103
South Dakota	115,312	21,200	136,512
Maryland	122,878	165,383	288,261
Florida	140,169	77,702	217,871
Washington	148,074	156,661	304,735
New Jersey	148,561	366,650	515,211
Nebraska	201,629	86,761	288,390
West Virginia	218,528	74,474	293,002
Louisiana	241,693	128,684	370,377
Kansas	269,739	146,326	416,065
California	270,133	508,728	778,861
South Carolina	273,191	57,309	330,500
Minnesota	277,918	191,734	469,652
Wisconsin	296,553	229,635	526,188
Oklahoma	307,240	111,317	418,557
Arkansas	311,713	63,603	375,316
Virginia	322,555	127,674	450,229
Mississippi	333,522	53,880	387,402
Michigan	339,777	416,154	755,931
Iowa	357,064	202,124	559,188
Indiana	357,485	338,981	696,466
Tennessee	358,904	129,488	488,392
Alabama	375,697	104,695	480,392
Kentucky	376,293	134,688	510,981
North Carolina	397,133	98,136	495,269
Missouri	422,201	295,055	717,256
New York	435,940	889,174	1,325,114
Georgia	436,368	150,141	586,509
Illinois	483,602	706,812	1,190,414
Ohio	501,808	714,734	1,216,542
Texas	643,608	303,021	946,629
Pennsylvania	649,665	1,076,559	1,726,224
Totals	11,212,652	9,484,552	20,697,204

A Public Policy Campaign Based on Local History

A COMPREHENSIVE public policy campaign designed to acquaint citizens with the fundamental needs of communities for utility service has been inaugurated by companies under the management of Charles H. Tenney & Company, Boston, Mass. The plan includes a series of newspaper advertisements run with weekly changes in the territory of the local company. With variations to meet differences in the local situations, the campaign for each company is planned to follow the same general line of development. Beginning with a short, interesting reference to the earliest history of the local community, the necessity for co-operation among the original pioneers and later settlers is shown. The first set was started by the Montpelier & Barre (Vt.) Light & Power Company before Thanksgiving, 1921. Insertions have been started in the territory of the Haverhill (Mass.) Electric Company, and shortly the Fitchburg (Mass.) Gas & Electric Light Company will begin a series of display advertisements in the local press. Enough material has been planned for these companies to cover virtually a year in presentation.

THE PIONEER PLANT
WITHIN two years after the opening of the first electric light and power plant in Montpelier, though several important changes had been made in order to take care of the constant requests for extensions to the lines, it became apparent that something must be done to secure additional capacity to meet community needs.
Accordingly, on September 1st, 1888, the Standard Light & Power Company purchased from the Pioneer Mfg. Company the Pioneer Mill, with its added facilities for water power. This was known as the Pioneer Plant. When it went into operation, it was thought that the light and power problem for Montpelier and vicinity had been solved for all time.
But communities, like individuals, seem as they progress to outgrow existing conditions. Though the Pioneer Plant improved the situation, it soon proved inadequate to keep pace with rapidly expanding industrial and commercial activities.
Montpelier & Barre
Light & Power Company

WHERE NO WHITE MAN TROD
THREE hundred years ago the Merrimac, in its swift course to the sea, saw along its banks only the primitive villages of the Indians, and bore upon its tumbling current only their rude log and bark canoes.
The first picture we have of the place we now call Haverhill was just such an Indian village, which the Indians called Pentucket, a group of twenty or thirty wigwams, just east of where Little River joins the Merrimac, with the virgin forest crowding close upon them.
In the series of historical sketches of which this is the first, we propose to review some of the history-making episodes that attended the early settling of Haverhill, and to tell you of the share which this Company has had in developing the natural resources of the region round about the Merrimac, where today thrives a community of increasing industrial and commercial importance—a community of which we may all feel proud to be a part.
HAVERHILL ELECTRIC COMPANY

HISTORICAL PUBLICITY FOR A UTILITY

JOHNNY THE MILLER
JOHNNY the Miller was a popular man in his community. The people for miles around brought their grain to his grist mill, and he ground it into fine white flour, and kept a portion of the grist in payment for his services to the community.
Johnny the Miller operated the first public utility in the days when history was young.
How Johnny would marvel if he could come back today, and see the great industrial centers that have sprung up where his old grist mill stood two hundred years ago—vast modern plants, turning out thousands of tons of flour in a day, and sending it to the seaboard in swift moving trains, to be stored in huge grain elevators.
This is but one phase of the great miracle of modern community life, a dream that was turned into reality with the coming of the public utilities.
Right here in our own community, the Montpelier & Barre Light & Power Company is doing its part in the realization of that dream by constantly maintaining high standards of service, and thus helping to make this community a happier and better place in which to live and work.
Montpelier & Barre
Light & Power Company

An Interesting Anecdote of the Benefit of Customer Ownership

CONCRETE examples of the direct benefit of customer ownership to the central-station companies were cited recently by Samuel Insull, president of the Commonwealth Edison Company, in an address before the Chicago Chapter of the American Institute of Banking. He related some interesting anecdotes, the point of which can best be told in his own words. Mr. Insull said:

"What I am deliberately after is public ownership. Not municipal ownership, but public ownership that will result in a vast army of stockholders—and we have 500,000 of them in the State of Illinois today—to stand guard over their own property. I heard a story a few months ago of a case of a politician, I think it was in Minneapolis. He came home after the Legislature and was talking to his neighbor. He said: 'I think it is about time we went after this electric company. I think we ought to get the Legislature after them.' His neighbor said: 'Who do you mean? Our electric company?' He replied, 'What do you mean by "our electric company?" That company is controlled by a firm down here in Chicago, H. M. Byllesby & Company.' 'Oh, no,' said the neighbor, 'that company is owned around here. You are the only man in this block who is not a stockholder, and if you will go through your constituency, you will find there so many men and women who are stockholders that if you start to raise Cain with that institution they will raise Cain with you.'

"That is what we are after. There is nobody more alive to the fact that we are after it than the politician. That is what we are going to get, and when the junior securities of all these local public utilities are owned by the people themselves as individuals, you will hear less about municipal ownership, you will hear less about attacks upon utility interests, and you will find that the senior securities that the local utilities put out will be very desirable collateral whenever they come over your counters."

What Other Companies Are Doing

Chicago, Ill.—Customer-ownership sales of preferred stock at the operated properties of Standard Gas & Electric Company during February, 1922, resulted in 1,526 transactions having a total par value of $788,100.

Toledo, Ohio.—The Toledo Edison Company, as is its custom in all matters relating to the welfare of the city, took a prominent part in the recent "Talk Toledo" week. Frank R. Coates, president of the company, headed the church committee and secured co-operation from all churches, and a sermon on Toledo was given from every pulpit in the city. E. R. Kelsay headed the speakers' bureau, and every civic organization holding a meeting that week was furnished with a speaker. The company's display windows were also used to feature "Made-in-Toledo" products.

Hartford, Conn.—To help its customers learn from experience how much service the Hartford Electric Light Company is able to render under its new residential rate it is proposed at the end of this year to return to every customer whose bill is increased over what it would have been under the old rate the full amount of such increase as a reduction on the price of a flatiron or any other appliance purchased during the year.

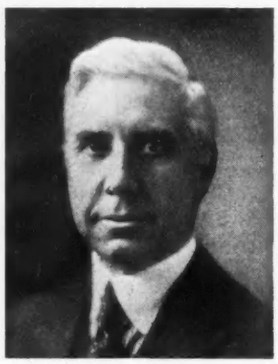
Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

An Answer to the Question "Who Will Sell Electrical Appliances?"

By Fred Wardell
President Eureka Vacuum Cleaner Company, Detroit, Mich.

MANY electrical men are watching with considerable interest the inroads made by non-electrical dealers into the field of electrical merchandising and wondering how far the distribution of electrical goods is ultimately to be carried on through the channel of hardware, drug, automobile-supply and sporting-goods stores. They seem to feel that this is a menace, that the electrical business should be kept all within the hands of electrical men, and that the growing interest of non-electrical merchants in electrical goods will inevitably limit the opportunity of those now in the appliance business. I would say that, irrespective of the nature or class of dealers who make an attempt to sell electrical goods at retail, the mere fact that they make the attempt should be just reason to encourage their support. They will do their part in popularizing electrical merchandise, and their sales will help the electrical industry along just that much more.



FRED WARDELL

The hardware store is even now a big factor in the sale of electrical merchandise. The hardware merchants should be encouraged. They are for the most part good merchants and are well financed. This is particularly true in small towns. The hardware store is well known and is in constant, intimate contact with every home, selling to all the households of the community other kinds of home supplies, including non-electric labor-saving devices and other conveniences.

Drug stores undoubtedly will become a big factor in the sale of small heating appliances, but as for vacuum cleaners and the larger appliances—never. Automobile-supply and sporting-goods stores, in my opinion, are not to be taken seriously.

The central-station company that adheres to an aggressive merchandising policy will always be the best single outlet for electrical goods. The reasons are obvious. The central-station companies represent our best dealers both in small towns and large, and particularly so in the smaller cities. In the minds of the people they are the established headquarters of electrical knowledge and service.

Next to the central station in the smaller cities, of 50,000 and less, is the contractor-dealer, while in cities of greater population the department store is the best outlet. The contractor-dealer will always be a big factor in the sale of electrical appliances, principally because of the number of contractors in business. As he is the man who wires the homes or installs the additional convenience outlets, he is in a most favorable position to suggest the appliance that the customer should buy.

Notwithstanding the favorable positions of the contractor-dealer, the hardware dealer and the central-station company, the old-established big dealers, the department stores, will eventually become—if they are not already—the popular leaders in the retail selling. They have the crowds, the finances, the advertising and the prestige and are therefore in a position, along with the central station, to dominate. As is quite evident, the department store is already taking the electrical merchandise business seriously—even to the extent of creating separate departments. As electrical goods become more popular, the department store will take even more interest in this business.

In the sale of the larger appliances, such as vacuum cleaners, washing machines and the like, the specialty stores in the larger cities are fast jumping into first place. Their combined sales are enormous, and with their highly organized and trained sales forces they are doing a first-class job of combing each block for prospective customers. But the electric specialty stores will never be a big factor in cities of less than 75,000.

In summing up the situation I would say that the contractor-dealer will be pushed to the background as an appliance merchant in cities of more than 75,000 population, while in the cities of less population he will have to split with the department and hardware stores and to recognize the central-station company as the big outlet. There is room enough for all, however, and every merchant who is willing to contribute his influence to the educating of the people in the knowledge of and desire for electrical appliances should be encouraged. For this is still our pioneering period, and the sooner we can build up the universal popularity the sooner we shall come into our own.

Research Must Be "Sold"

By C. E. Skinner
Assistant Director of Engineering
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

FROM a strictly utilitarian standpoint it is futile to carry on research unless its products can be made useful. The marketing of research products has been little discussed and is perhaps less understood. Industrial laboratories often find it necessary to conduct scientific investigations along lines presumably of no immediate commercial value but which are aimed to give more knowledge of the fundamental principles underlying the operation of the manufactured product.

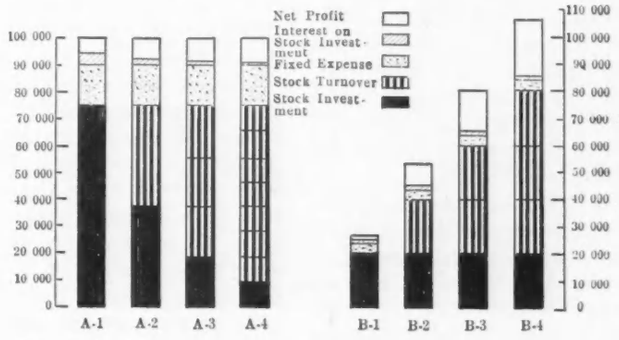
In the end, however, research must be "sold," in the modern sense of the word. The problem is to get the results of the investigation incorporated into the product and into the hands of the ultimate user. Those who do research and obtain results which they are sure should be useful are often astonished at the indifference of others to the value of their work. Hence the need of a "selling" campaign, which consists in convincing all with whom the investigator has to do that his research is worth while and that the results will show a gain in quality or cost or performance over the formerly accepted methods. The better known the investigator, the less trouble in "making a sale," which is convincing those responsible for the financial operations of an organization that it is worth while to spend money on the investigator's scheme. The strategy of such a "selling" campaign must be as varied as the researches themselves and must be governed by the circumstances under which the investigation is made.

Probably the easiest "selling" campaign is where the results are specifically requested by an individual or group who need to attain certain ends and have no means themselves of accomplishing these. The hardest "sale" is doubtless where a new device or new principle is developed independent of the users and where a change is required in well-known methods or products to permit its use. Where the investigation can be carried on with the co-operative interest of designing engineers, and when feasible in the confidence of workmen and foremen having factory process work to do in the development of the product, much will be gained.

If we develop a new device based on a newly discovered principle, the success or failure of the device may depend entirely upon conditions aside from its intrinsic merit. It must function in ways readily understood, and if too much "translation" is required to utilize it, as, for example, in the introduction of a new method of measuring the quality of a material, the research worker will have a hard time in getting the device accepted. A campaign of education is often necessary. Products of research sometimes fail because of obscure difficulties which are not due to the new product but to extraneous causes undiscovered until long after the apparent failures have given it a bad reputation.

Usually it is much harder to incorporate results of research into old processes than into new. In a large manufacturing plant the best approach is usually through new methods and processes which are necessary from time to time. Co-operation with the factory men in such cases yields good fruit. Many times wholehearted support can be secured by giving such men a sympathetic hearing and so far as possible credit for their suggestions, and complete success is sometimes insured by such a method where failure would surely result from an attempt to force its acceptance. The more intimate knowledge the investigator has of the problems of the engineer, the factory and the salesman, the more able he will be to shape his work to fit commercial requirements. Conversely, it is true that the engineer, the factory executive and the salesmen will be better in their own fields if they know and understand the problems of the research worker.

The Influence of Turnover



SERIES A represents sales amounting to $100,000, but the number of turnovers increases from one in A-1 to eight in A-4. Each increase in turnover reduces stock investment as well as interest, while the amount of profit increases. Series B shows uniform stock investments and cost of interest throughout, while the amount of profit increases with the number of turnovers.

The Relation of Turnover to Profit

CLEAR as the importance of stock turnover is, jobbers and dealers, as well as manufacturers, through inattention frequently violate some of its most fundamental principles. The recent statement by the Domestic Distribution Department of the United States Chamber of Commerce pointing out some of the costs and wastes of slow turnover are therefore particularly interesting and worth a bit of study. There are seven distinct classifications under which losses may occur when merchandise is not turned over as rapidly as it might be. These are investment, interest, mark-down, salaries and wages, shelf and storage room, prestige and reputation and inefficiency. An examination of these elements shows their relation to each other, as follows:

Invested money is the source of profit, which in turn depends upon the amount of goods in stock and upon the length of time which these goods are carried. It is evident that to double the turnover comes to the same thing as doubling the amount of stock without increasing the investment. Or, vice versa, one-half as many turnovers results in doubling the amount of money invested for the same quantity of goods.

Interest must be paid upon all borrowed money and most merchants are borrowers. If the turnover is reduced from a period of six months to one of three months, the interest on a given loan is reduced in the same proportion.

Mark-downs are required when goods have proved unsalable at the original mark-up, or when too many were bought or when the articles become shopworn or out of date. Each of these conditions delays the turnover.

Salaries and wages must be included because every operation in every establishment costs something. When an unprofitable operation is performed it represents a loss.

Shelf or storage room is a definite part of the expense of doing business; and that portion which is devoted to slow-selling merchandise is wasted.

Prestige and reputation for the high character or timeliness of merchandise is sought by most stores. There is a distinct waste measurable in dollars and cents when the reputation of an establishment is lowered by unstylish or shopworn goods.

Inefficiency always results in waste. The buyer whose judgment often is wrong usually makes the mistakes from lack of knowledge as to the stock and the speed or slowness with which it is moving. Frequent mistakes cause uncertainty in the mind of the one who makes them and tend to worse errors as time goes on unless some measures are taken to make them improbable.

The accompanying chart presents a graphic picture of the influence of turnover both on the investment required and the resulting profit.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

The Proportioning of Steam-Turbine Blading.—H. M. MARTIN.—The author develops equations, curves, tables and other data necessary for the construction of the blades in steam turbines. The article is in five sections, published in successive weeks. In the first part a method is explained for determining, from the top valve and the condenser data and the steam rate required, the thermodynamic head under which a proposed turbine will operate. In the second a particular case illustrating this method is considered, and additional data that apply to turbines of all sizes operating under the same conditions and at the same steam rate are given. The method of fixing the blade height is described in the third article, and since this is in part empirical the author works out in this section the error involved in the method. It is shown that this error is in general insignificant save in cases necessitating the use of wing or semi-wing blades. In the fourth section a reaction turbine is proportioned with an output equal to 6,000 kw., and in the last installment impulse turbines are considered.—*Engineering (London)*, Jan. 6 to Feb. 3, 1922.

Split and Layer Windings for Small Armatures.—A. C. ROE.—The author outlines the repair-shop practice for handling split windings both chorded and diametrical, split-loop windings and layer windings. Reasons are given for the use of these windings, and their advantages in some cases over the straight-loop winding are explained. Many diagrams are given illustrating the various windings and showing the methods to pursue.—*Electrical Review and Industrial Engineer*, February, 1922.

Lamps and Lighting

Artificial Daylight.—J. S. DOW.—Discussion of the application of this form of lighting to textile and dyeing industries. The author considers the development of artificial daylight and how the advances that have been recently made, especially the invention of Chance's "daylight glass" and the Sheringham daylight, are likely to be used in these industries.—*Electrician (London)*, Feb. 24, 1922.

Artificial Lighting in Dentistry.—PERCY RUSSELL.—A discussion of lamps used by dentists for dental lighting to supplement daylight, for generating light within the mouth for viewing interior surfaces and for viewing tissues by light transmitted through them. —*Transactions of the I. E. S.*, January, 1922.

The Lighting of Large Dry Goods and Department Stores.—A. L. POWELL.—Without artificial lighting the modern large store would not be an economic possibility as space is too valuable in cities to design a building so that adequate daylight can penetrate a long distance from the street. Consequently the continuous use of lighting equipment is a necessity. Among the items that the author discusses are the desirable intensity of illumination, color of light and diffusion, arrangement and systems of lighting, choice of reflecting or diffusing equipment, the selection of fixtures and the spacing of outlets and hanging height.—*Bulletin L. D. 132 of Edison Lamp Works.*

Generation, Transmission and Distribution

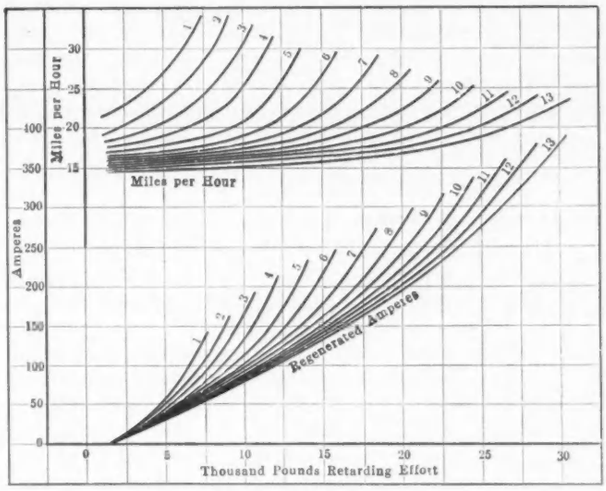
Utilization of Waste Heat in Generating Stations.—Abstract of two papers read before the (British) Institution of Electrical Engineers. The first, by C. I. Haden, suggests the combination of distribution in the form of steam or hot water with electrical generation so as to utilize the fuel resources to better advantage than at present. This could be effected by converting into heat stations generating stations which would otherwise be discarded. The second paper, by F. H. Whysall, deals with the practical and economic difficulties of any such scheme.—*Electrician (London)*, Jan. 27, 1922.

Hydro-Electric Plant at Seira, Spain.—J. REYVAL.—The paper contains a very detailed and profusely illustrated description of the largest Spanish power transmission system. The generating station is at Seira, on the river Esera, and utilizes a water head of 145 m. Four horizontal-shaft spiral-type turbines of 12,500 hp. each are directly connected to 9,000-kva., three-phase, 6,000-volt, 50-cycle generators, running at 500 r.p.m. Four 9,000-kva. forced-oil-cooled transformers step up the generator voltage to the transmission voltage of 120,000. At present only one three-phase line connects the station with the city of Barcelona, 175 miles distant, but it is planned to establish a second, independent line as soon as the fifth generator is installed. Along the line, which runs through a very rough and mountainous country, three 6,000-kva. substations are installed, and at its end, at the outskirts of Barcelona, a main substation with a present rating of 36,000 kva. is in operation. The transmission cables are of copper of 86 sq.mm. cross-section per phase and are suspended on ten-disk chains. All towers are of fabricated-steel construction. On top of the towers a galvanized-iron protective cable of 50 sq.mm. section is laid out. It is carefully grounded at every fourth tower. The entire electrical equipment was built by the Swiss Oerlikon works, and all guarantees are based upon the German V. D. E. rules.—*Revue Générale de l'Electricité*, Jan. 7, 1922.

Traction

Regeneration Characteristic Curves of Direct-Current Locomotives.—C. A. ATWELL.—Owing to the comparative newness of regenerative brakings on locomotives, the methods of representing the regeneration characteristics of the direct-current motor are not very familiar, nor are the methods standardized. On account of the large number of quantities that vary during regeneration it is desirable to plot as characteristic curves those quantities which will be of the most value to the

one using them. After showing several ways in which these variables may be plotted in curve form, the author suggests the form shown in the accompanying illustration as being the most logical and useful. In this



LOCOMOTIVE REGENERATION CURVES FOR INTERMEDIATE-SPEED COMBINATIONS

illustration the curves show speed and amperes regenerated in terms of retarding effort for each step of the controller.—*Electric Journal*, March, 1922.

Installations, Systems and Appliances

Flexibility of Electrical Service in a Large Textile Mill.—This article describes how a well-designed installation permits close control of production and facilitates changing of equipment. The plant referred to is the new weaving building and raw-stock dye house of the Riverside & Dan River Cotton Mills at Danville, Va., in which there are 5,040 motors of ½-hp. rating, each directly connected to a loom.—*Electrical Review and Industrial Engineer*, February, 1922.

The Textile Industry and Public Electricity Supply.—W. J. H. WOOD.—The textile manufacturer wishes to be convinced that in adopting electric drive he will gain advantages which cannot be obtained in any other way. The author considers the particular cases of (1) an existing steam-driven mill changing over to the electric drive and (2) a new mill. In both cases the relative economies of private generation and public supply are compared. The heating problem, which is in many cases the determining factor, is shown to be capable of solution by electrical means.—*Electrician (London)*, Feb. 24, 1922.

Electrophysics and Magnetism

Natural Convective Cooling of Wires.—A. H. DAVIS.—An investigation of the apparent discrepancy between published data for the natural convective cooling of wires and the hydrodynamical theory of the phenomenon.—*Philosophical Magazine (London)*, February, 1922.

High-Frequency Resistance of Inductance Coils.—GREGORY BREIT.—At high frequencies Ohm's law does not give complete information about the current flow in inductance coils because the current flow is modified by induction effects of magnetic as well as electrostatic nature. As a result the current density is not uniform over a given cross-section of wire, nor is it the same for different cross-sections of the wire. The effects of this non-uniformity and its measurement are the subject of the investigation described in the paper.—*Scientific Papers of the Bureau of Standards, No. 430.*

Electrochemistry and Batteries

Progress in the Use of Storage Batteries.—H. BECKMANN.—The author reviews the vast field of storage-battery traction in an elaborate article. He describes the latest types of storage-battery-driven suburban motor trains with a special battery tender, deals with battery switching locomotives and mine locomotives which may have permanently installed or readily exchangeable batteries, mentions the great possibilities of the small one-man electric mule, gives a general outline of the rentability of electric passenger and freight automobiles, touches upon the use of storage batteries in submarines, in gasoline-driven cars as starter batteries and in miners' safety lamps, and finally mentions and describes the new design of small-output but high-voltage batteries for supplying the anode voltage for electron tubes in radio work. The fact that Germany has to import all of its gasoline but has an abundance of hydro-electric power will be a great impetus toward the more general electrification of its city trucks. The author believes that at least 40,000,000 marks a year could be saved by changing over one-half of the gas trucks in Berlin to storage-battery operation. This would not only be a great national benefit but would bring savings in operation and a welcome night load for central stations. — *Zeitschrift des Vereines Deutscher Ingenieure*, Jan. 28 and Feb. 4, 1922.

Telegraphy, Telephony and Signals

On the Grounding Reactor.—SADATOSHI BEKKU.—With the increase in number of the high-voltage power-transmission systems the subject of inductive interference on telephone and telegraphic circuits has become one of the most important topics of study among transmission and communication engineers. Various methods of grounding and different types of grounding reactors are described. The effects of these in producing interference on communication circuits are given.—*Journal of Institute of Electrical Engineers of Japan*, February, 1922.

Low-Voltage Rectifier Design When Employing the Three-Electrode Vacuum Tube.—R. D. DUNCAN.—A discussion of the theory and design of the low-voltage rectifier for furnishing plate voltage required in the operation of relatively low-power radio telegraph and telephone transmitters of the thermionic type. Based upon the theory, equations are worked out from which the information required to carry through the design of the rectifier transformer may be obtained.—*Radio Review*, February, 1922.

Miscellaneous

International Joint Commission Recommendations.—The detailed plan for the construction of the St. Lawrence ship channel and power development that has been submitted to Congress, together with the recommendations of the commission, are dealt with and the recommendations are enumerated. A final report issued by the commission after a careful study of the situation from every possible angle states that the proposed deep waterway is practicable from both an engineering and an economic standpoint and that it would result in adding very materially to the prosperity of the United States and Canada.—*Canadian Engineer*, Jan. 24, 1922.

New Books

Reviews of the latest contributions to technical, industrial and commercial literature of particular interest to members of the electrical industry.

WITHIN THE ATOM. By John Mills. New York City: D. Van Nostrand Company. 206 pages, illustrated.

As many people are beginning to recognize, it will be through the more intimate knowledge of the electronic construction of matter and the discovery of methods of controlling these electrons that means will be evolved for releasing the world's greatest store of energy and for applying it to useful commercial purposes. In fact, signs point to the fact that electrical developments of the next decade are going to be so closely tied up with electron control that no one who expects to keep abreast of the times can afford to go along without studying what science has discovered so far. To those persons who do not want to delve into the more scientific works on the subject this recent book by Professor Mills may be highly recommended. It deals with an abstruse subject in a most entertaining and instructive manner. Being written in semi-popular form, it can almost be read like a novel, and still it embodies the exactness of a scientific discussion. No previous knowledge of the subject or more than a general knowledge of physics is required to understand it. The author has a happy faculty of presenting word pictures that stick in the mind without any effort on the part of the reader. Starting with the generally accepted conception of the divisibility of all matter into merely positive and negative electrical charges, the author builds up the present theory that all atoms have a positive nucleus surrounded by negative satellites, the only difference between atoms being the number and disposition of the charges. By this means he explains many chemical relations and actions such as the reason why certain elements act like each other, why multivalent elements act with different valences under different conditions, and the electronic phenomena which take place during the disintegration of elements like radium. Alpha, beta and gamma rays become more than Greek terms and radioactive and X-ray phenomena become more understandable. The interpretation of electrical and magnetic phenomena, light, etc., in terms of the electronic theory cannot help to stimulate some imaginative thinking regarding what may be accomplished when all physical manifestations are correlated as to fundamental cause and when electrons are brought under the control of human beings through this knowledge.

SWITCHING EQUIPMENT FOR POWER CONTROL. By Stephen Q. Hayes. New York: McGraw-Hill Book Company, Inc. 454 pages, illustrated.

Information on switchboards and switching equipment can be found in very condensed form in some electrical handbooks, and specific data on definite appliances can usually be obtained from manufacturers, but this book is the first to bring such information within the same covers. Following a description of the various pieces of switchboard and switching equipment, the author successively considers the main connections required in a power plant, switchboard panels of various sorts, construction of breaker and bus structures, and finally the general arrangement of that part of a power plant given over to switching equipment. The chief object of the book is to explain what may be expected of the equipment available, but it should also make it easy to specify equipment that can be easily obtained and will operate satisfactorily. A sequel might profitably be prepared on the factors to take into consideration in installing, operating and maintaining the equipment so that maximum reliability and economy will be attained with the least outlay. The work as it stands is, however, well worth possessing.

COSTRUZIONI ELETTROMECCANICHE. By Prof. Ettore Morelli. Turin: Unione Tipografica-Editrice Torinese. Two volumes; first volume 1,394 pages and tables; second volume 824 pages and tables.

The author, using the theoretical and practical knowledge acquired after many years of teaching in the Royal Polytechnic in Turin and his previous engineering practice in large electrical shops in Europe, has gathered in these two volumes on electromechanics much that will interest engineers, technical directors and designers engaged in manufacturing or in the selection of electrical generators and motors for various applications and uses. The book should also be of assistance to engineers interested in acceptance tests and performance characteristics of electrical apparatus employed in the construction and operation of power plants in public utilities or private industries.

In the first section the author deals with the design, calculation and construction of all the magnetic, electrical and mechanical parts of direct-current generators. This section, while it refers especially and specifically to one class of machinery, is in reality of general importance, as many calculations and processes of construction are common to the principal types of machines. The author gives attention not so much to the construction of the individual machine as to the industrial problem of the manufacture and production in series of a great number of similar machines. On the basis of the broad premises of the section on direct-current generators, the author in the following sections applies similar studies to the other classes of electrical machinery, namely, alternators, transformers, direct-current and alternating-current motors, converters, cascade motor-generator sets, and so forth.

In the last section the author, after having studied the electrical machines *per se*, analyzes the problem of coupling them with machinery. After two chapters on the electrical and mechanical accessories most generally used in practice, Professor Morelli studies first the coupling of different-type generators to hydraulic and thermal prime movers and subsequently the coupling of electrical motors to individual-drive operating machinery as applied to agriculture, mines, transportation, metallurgical industries, paper mills, signals and remote controls, etc. The subject is treated in a clear way that will appeal to technical men. The exposition rests on the basis of modern theory as used in calculating machines and derived from the study of extensive data and designs of machines actually constructed.

DIE SAUGSTRAHL TURBINE. By Dr. Hans Baudisch. 48 pages, 37 illustrations, 16 examples. Leipzig and Vienna: Franz Deuticke.

The booklet covers the theory and the design of the "draft-tube" water turbine, sometimes also called Kaplan turbine.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

No Lower-Freight-Rate Decision for Week or More

THE decision of the Interstate Commerce Commission in the matter of a general reduction in freight rates, it now appears, will not be forthcoming before April 15. At present the case is being studied by the commissioners individually. If they should find themselves in substantial accord, the decision probably could be handed down as early as April 15, but should there be important differences between them, it obviously will extend the time required for the consideration of the case.

Effort Being Made to Reopen Open-Price Association Case

A REHEARING upon the open-price association practice in trade or a modification of the decree in the hardwood-lumber case to permit of the collection and dissemination of reports on production, sales and stock has been requested of the United States Supreme Court in a petition filed by the American Column & Lumber Company, the defendant in the recent suit in which the court decided the practice to be in violation of the anti-trust law. The lumber interests base their request on an alleged misinterpretation of certain phases of the case and make general denial of the conclusions of the court that the purpose of the practice employed by the lumber interests was to curtail production or enhance prices.

German Patent Convention Not to Be Revived

THE President is understood to be satisfied that it would be unwise to revive the patent convention of 1919 with Germany. The Senate recently authorized the President to revive this patent convention, but it is believed that this action was taken without a thorough understanding on the part of most members that it would exempt German patents taken out in this country from any working clause that might be enacted.

The whole matter of a patent working clause is to be threshed out at once. Senator Stanley of Kentucky has introduced a bill which has been approved by the War Department, and public hearings on the bill have been called for April 5. The salient feature of the Stanley bill is that any patent issued to any person under the provisions of the act shall contain a proviso to the effect that if such patent is not worked so as to result in actual production in the United States of the article patented in reasonable quantities within a reasonable time from the date of its issue, which in no case shall be less than two years or more than five years, the United States reserves the right to issue a license for its manufacture in the United States, and to use and sell the subject matter thereof subject to the conditions provided.

In all probability the definition of a reasonable time will be altered so as to leave it to the discretion of the administrative officer.

Fifteen Billion Dollars of Tax-Exempt Securities Outstanding

TAX-EXEMPT securities to the extent of $15,000,000,000 have been marketed in this country, according to an estimate made by the Secretary of Agriculture in a public speech in Washington April 1. Secretary Wallace was explaining why the Federal Land Bank bonds are tax free.

Bill to Limit Federal Court Jurisdiction Over Commission Rulings Opposed

ALTHOUGH it would seem from the attitude of members of the judiciary committee of the House of Representatives that there is little chance for Representative Bacharach's bill to limit the jurisdiction of federal courts in matters pertaining to state public utility orders, it seems likely that the bill will be vigorously advocated. It is believed that it will make little legislative progress, however, if the opposition to the proposal continues active. A further hearing on the bill will be held April 25. In explaining the object of the legislation, Mr. Bacharach said:

"This bill seeks to amend the judicial code of the United States so as to compel utility corporations dissatisfied with the findings of the state utility commissioners to carry their cases through the courts of the state and then on to the Supreme Court of the United States if necessary. The enactment into law of this bill would not deprive utility companies of any of their just rights, for they have every protection afforded them in the high type of men who compose the membership of the higher courts of the various states."

To enact such a bill as that proposed by Mr. Bacharach would be highly injurious to the public welfare, in the opinion of Everett T. Wheeler, of the jurisprudence and law reform committee of the American Bar Association, who said:

"We often hear criticisms upon the writ of injunction from those who feel its effects, but in my judgment, derived from fifty years' experience at the bar, it is just as beneficial and important for the public welfare as the writ of habeas corpus. It prevents parties from taking the law into their own hands and provides for a continuance of existing conditions until a competent court has adjudicated the rights of the parties."

One of the most able of those who spoke for the bill

was Clyde M. Reed, chairman of the Kansas Public Utilities Commission, who said:

"It is not in the interest of public policy for the government to interfere where a body has been created under the state law, for such a body has the benefit of the state laws and the state judicial bodies. If a constitutional question is involved, it can appeal to the Supreme Court of the United States.

"We have had in Kansas during the last eight or ten years a very large volume of litigation over these questions, invoking the state courts and federal courts, and many of these cases have come direct to the Supreme Court of the United States. Usually the state power has been upheld, but there has been a very considerable interference in the meantime by the lower federal courts."

Paul V. Keyser of Des Moines, representing the Investment Bankers' Association of America, said that if the suggested legislation be adopted it will affect very materially the value of securities already issued and outstanding. In addition, it would have a direct and immediate effect upon the credit of the utilities in respect to all additional capital requirements.

William Chamberlain of Cedar Rapids, Iowa, representing utility companies in Iowa, Illinois, Indiana, Michigan and Tennessee, said in part:

"I think that it would be a serious thing to the finances and to the development of the utilities in the entire Middle West to have a law passed which would say to the Eastern investors, after the protection which they have long enjoyed, which the traditions of this government have promised the citizens, and which the constitution has given to the citizens of one state for their investments in another state, that these investors have ceased to enjoy the protection of the federal courts. I think that the result of it would be that in the financing of the utilities in the West you would practically drive away from us many millions of dollars which would otherwise be available for that development."

To Increase Service in Southern Indiana

THE Southern Indiana Gas & Electric Company of Indianapolis has made arrangements to spend between $400,000 and $500,000 this year for improvements, Frank J. Haas, vice-president and general manager, announced recently. The first expenditure will be for equipment to increase the capacity of the electric light plant. Some of the improvements on the program are the installation of a 7,500-kw. turbine, two 500-hp. boilers, new coal and conveying apparatus and a large addition to the Division Street power plant.

Carolina Power & Light Contracts for 20,000 Kw. of Energy

INSTEAD of building at this time a hydro-electric plant on the Pee Dee River, the Carolina Power & Light Company has purchased 20,000 kw. continuous power from the Pallassee Power Company, the plant of the Aluminum Company of America at Badin, N. C. The Aluminum Company has not been running in North Carolina at anywhere near full load for three years, so that there is considerable surplus power available.

The Pallassee Power Company's plant is just above the Carolina Power & Light Company's Swiss Island site, on the Yadkin River.

The Carolina Power & Light Company is going to build 65 miles of double-circuit steel-tower 110,000-volt line to carry this purchased energy. In addition, the company is planning construction of more transmission-line mileage and a number of substations. Expenditures for additions to the Carolina Power & Light Company's system, including that of its subsidiaries, the Yadkin River Power Company and the Palmetto Power & Light Company, are expected to run in the next year or two up to $4,000,000.

Tampa to Put Light and Power Wires Underground

TO remove danger of interruptions of service from high water in the cable house or from fires in the lower downtown district, the Tampa (Fla.) Electric Company is planning to start at once to put the electric light and power wires and cables leading from its east cable house underground, at an expense of approximately $300,000. This is part of the improvements and extensions program for 1922, when $800,000 is to be spent on the electric and street-railway system.

To finance this expenditure stockholders have been asked to meet May 2 to ratify the action of the board increasing the capital stock from $2,879,800 to $3,454,800. The property is under Stone & Webster management.

Ohio Adopts New Overhead Rules

ANNOUNCEMENT is just made by the Public Utilities Commission of Ohio of its adoption on March 6 of a set of rules governing overhead electric lines in situations where such lines cross or more or less parallel the line of a railroad, interurban or other public utility. The rules are divided into nine sections, the first of which consists of "General Rules and Definitions" applicable to all situations within the scope of the entire set of rules. The second, third, fourth and fifth sections are complete detailed specifications covering specific situations. Each of these sections is self-contained and free of cross-reference to other sections. The seventh section consists of a set of general principles or rules governing inductive interference, the eighth being reserved for rules governing lines crossing under railroad tracks. The ninth contains a brief set of rules applicable to the status of construction in existence prior to the adoption of these rules. In addition to the rules proper there are a number of elaborate appendices which contain valuable informational data, carefully prepared to assist in the practical application of the rules in the several sections. The work was prepared through the co-operative endeavor of a general committee, representative of the railroads and public utilities interested, whose report to the commission was the basis of the final rules adopted.

A feature of primary importance which appears throughout these rules is the insistence upon co-operative solution of problems between the parties interested, advance planning and proper notification, so that the public might be served by all with the least total cost consistent with safety and good service.

In the section outlining the "General Scope and Application," there is emphasized the necessity for co-operation and advance planning. The general principles by which both supply and signal companies should be guided in the location of lines on public highways are

outlined. This portion of the rules represents an entirely new treatment of the subject and recognizes the rights of both interests concerning occupancy of the highway for their respective services, without drawing any definite restrictive limitations on either class of utility.

Danville Municipal Plant Expands

CONTRACTS totaling $81,098,80 for the installation of additional generating equipment in the Danville (Va.) municipal electric light plant have been authorized by the Council. The General Electric Company will supply a 3,000-kw. turbine at the cost of $42,885 and a motor-generator for $3,816. The Babcock & Wilcox Company will be awarded the contract for boilers for $18,500, and the C. H. Wheeler Company the condensers for $10,000.

Niagara Falls Power to Install Three 70,000 Hp. Units

AUTHORITY to allow an amendment of plans on the part of the Niagara Falls Power Company which will permit the installation of three hydro-electric units of 70,000 hp. capacity each and of one forebay, to replace five proposed units of 37,500 hp. capacity each and two forebays, was granted by the Federal Power Commission at its meeting on March 27.

Michigan Utilities Planning Spring Expansion Programs

WITH the coming of spring considerable expansion and construction is being planned by Michigan electric light and power companies, according to reports from the Michigan Committee on Public Utility Information. Plans to serve the northwestern Michigan towns of Marion, Lake City, McBain, Evart, Tustin, Leroy and Avondale are progressing through the development of a water-power project in Winterfield township, Clare County, to be known as the Winterfield Light & Power Company. Most of the financing has been completed in the communities to receive service. John Perry of Tustin is president of the company, and W. L. Kinney is general manager.

Lake Huron and Saginaw Bay summer resort districts expect to obtain electric power this summer from the Central Power Company of Bad Axe. Its lines now reach to Kinde. The city of Caseville is considering underwriting the construction of an extension to serve itself from Kinde also.

Pontiac is planning to extend its street lighting. City Manager Brower has told the Council that the lights in the business district are too close together and that they could be "staggered" by removing about thirty-five of them, which he would place on other streets.

Reports from Ludington state that the new power plant of the Stearns Lighting & Power Company, to cost $250,000, is going up rapidly.

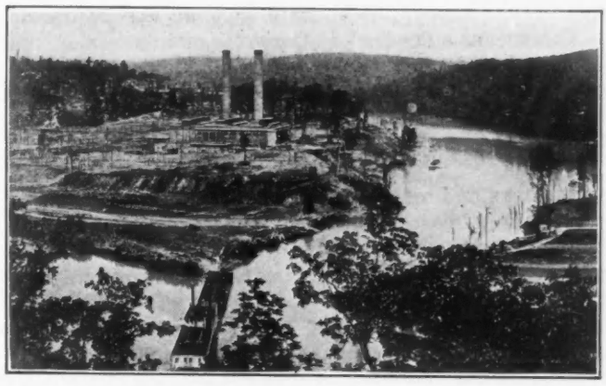
Installation of the hundred-thousand-dollar addition to the Citizens' Light & Power Company's plant of Adrian is well under way. The capacity of the plant will be doubled when the 2,000-kw.-installation is complete. Alpena officials are negotiating with the Alpena Power Company for service to operate the municipal waterworks and to light the streets.

Deadlock in Congress Over Muscle Shoals

HENRY FORD'S offer for Muscle Shoals has "blown up," as the result of the visit of inspection made by members of the Senate committee on agriculture and the House committee on military affairs to the government's one-hundred-and-six-million-dollar war-time nitrate projects in Alabama and the hydro-electric projects on the Tennessee River in connection with the partly completed Wilson Dam and other proposed dams.

This information is furnished to the ELECTRICAL WORLD by a special correspondent who has been traveling with the Senators and Representatives who went to Alabama and Tennessee to inspect the projects in connection with Mr. Ford's offer to purchase for $5,000,000; the Alabama Power Company's offer to lease and complete the Wilson Dam at its own expense; the Engstrum offer to construct on a cost-plus basis for the government, and the last offer, made by Charles L. Parsons, to produce chemicals with the first 100,000 secondary horsepower, in case that became available under any plan worked out by Congress.

Chairman Kahn of the House military affairs committee had a conference on Wednesday with President



GORGAS STEAM DEVELOPMENT ON WARRIOR RIVER

Right-hand portion belongs to the Alabama Power Company and left-hand part to the government.

Harding at the White House in order, if possible, to decide upon a policy in regard to the development of Muscle Shoals. Mr. Kahn said, after his conference with the President, that he would not press the idea he had previously suggested for a Muscle Shoals commission consisting of the Secretaries of War, Agriculture and the Treasury. Mr. Kahn's view of the President's position was also that no legislation could possibly come out of the House military affairs committee satisfactory to the President which would involve handing the whole problem to him. In other words, the President thought that the House military affairs committee ought to do its own work rather than to bring its problems down Pennsylvania Avenue.

It is understood that the President expects the House military affairs committee and the Senate committee on agriculture to require the presence personally of Henry Ford so that he may state to the people of the country just exactly what his intentions are in regard to Muscle Shoals, concerning which there is much doubt and fog in the minds of the legislators charged with the problem of the Muscle Shoals development.

Senator Norris, chairman of the Senate committee, in an interview granted the correspondent of the ELECTRICAL WORLD, stated that there is not sufficient time at the present session of Congress for the Senate to dispose of

the great mass of other unfinished business and at the same time pass on the merits of the Ford offer or that of the Alabama Power Company or any other offer. In these circumstances, in view of the fact that three years' time will be necessary in any case to complete the Wilson Dam before Mr. Ford or any other agency can obtain cheap water power with which to manufacture fertilizer or anything else useful in peace time and at peace-time costs, Senator Norris brought to the attention of his colleagues on the trip, receiving their support, a plan to have the government appropriate $7,500,000 to continue the work of building the Wilson Dam for a year, installing at the power house there the four units already on the ground and nearly all paid for by the government, which are planned to produce 120,000 kw. By the time that work is done, Senator Norris said, Congress would reach a decision on what to do with the nitrate and steam-power plants and how to administer the power from the Wilson Dam when it is ready.

On the other hand, members of the House committee on military affairs express their unalterable opposition to appropriating another dollar to go into the investment until it is decided in advance what is to become of the projects. The House has four times refused to appropriate money to continue work at Muscle Shoals.

This means a deadlock in Congress at this session, and members of the Senate and House committees are dubious whether anything will be done before the next session in December.

IMPOSSIBLE TO SEPARATE GORGAS PLANTS

Senators and members of the house in the inspection party were almost unanimously agreed that it is impossible to separate the plants of the Alabama Power Company and the government at the Gorgas development of the power company on the Warrior River. "You cannot unscramble these eggs," as Senator Norris expressed it, and when Chairman Kahn of the House military affairs committee was informed of this statement by Chairman Norris he added: "You can not only not unscramble the eggs in connection with the Gorgas plant, but it is impossible for any committee of Congress to resolve the legal difficulties in the way in connection with Nitrate Plant No. 2, which the Air Nitrates Corporation has an option to purchase just as the Alabama Power Company has an option to purchase the government's interest in its Gorgas plant."

Senator William B. McKinley of Illinois, himself a public utility man, has recently been appointed to the Senate committee on agriculture, in place of Senator Kenyon of Iowa. He was a member of the inspection party, and the Senators and Representatives had the benefit of his advice and information. Commenting for the ELECTRICAL WORLD on one feature of Mr. Ford's offer for the various plants and water-power rights at Muscle Shoals, Senator McKinley made this statement:

"In my opinion the steam plant at Sheffield, which was designed to furnish power for Nitrate Plant No. 2, now under lease as a stand-by plant to the Alabama Power Company, is worth $6,000,000 as a going concern today; the government's interest in the Gorgas plant is worth $3,000,000 of anybody's money as a going concern today; the transmission line of 88 miles from Gorgas to the nitrate plant is worth $1,000,000 of anybody's money. Here is property in these three items alone worth $10,000,000, and Mr. Ford is offering but $5,000,000 for everything that cost the government $106,000,000, to say nothing of the water-power rights in perpetuity.

"While ten or twelve years ago I should have frowned on the idea of the government going into this and completing these or any part of these projects," Senator McKinley said, "the state of the art has advanced so rapidly in recent years, it being now possible to send energy so many miles farther than ever before—possibly over a radius soon of 600 miles from Muscle Shoals—benefiting so many communities and giving cheap power to so many industries, that I think I should be willing to vote for Senator Norris' plan to have the government appropriate to complete the Wilson Dam, and possibly Dam No. 2, and at least install the four units on the ground to generate the 120,000 kw., while in the meantime we work on the many problems involved in the future of the Muscle Shoals development."

Senator McKinley stated that if Mr. Ford would make a fair offer he would not be against turning over the Muscle Shoals projects to him. He does not think that Mr. Ford has made a fair offer, and that point of view was expressed by many Senators and Representatives who were impressed with the great scope of the projects.

Would Investigate Radio Manufacturing Control

A RESOLUTION has been introduced into the House of Representatives calling on the Attorney-General to investigate and report charges that the General Electric Company, the Westinghouse Electric & Manufacturing Company, the American Telephone & Telegraph Company and the United Fruit Company have combined with the Radio Corporation of America for control of the manufacture and sale of radio equipment and regional rights emanating out of various patents.

The Radio Corporation of America is cited in the resolution for limiting supplies by various methods to hundreds of thousands of amateur users of wireless apparatus and for causing for the benefit of itself and its agencies not only unreasonably high prices for radio equipment but also a scarcity of parts. Although the demand for radio tubes cannot be accommodated even at extortionate prices, it is stated, both the Navy and the War Department have on hand more than 300,000 receiving tubes and large quantities of transmitting tubes, headsets, receiving sets, etc., as war surplus material, which the government is anxious to sell at half the wholesale price of the Radio Corporation but cannot sell or even give away because of an agreement with the American Telephone & Telegraph Company or other agencies promoting the monopoly. The cross-licensing of patent rights and the combination of the various interests, centering in the Radio Corporation of America, is held to be a conspiracy in restraint of trade.

Electric Rates at Washington Reduced

THE Public Utilities Commission of the District of Columbia has directed a reduction of 5 per cent in the rate of the Potomac Electric Power Company for electricity to Washington consumers. The reduction became effective April 1, but the consumers will not receive immediate benefit as court proceedings are pending regarding the valuation of the company. Previous to the final decision in this matter the old rate of 10 cents per kilowatt-hour will be collected and the difference between it and the lower rate since established will be impounded.

New York Edison Holds Second Annual Electric Vehicle Show

ENTHUSIASM and optimism marked the opening on Monday of this week of the second annual electric vehicle show conducted under the auspices of the New York Edison Company in its main showroom. As was the case last year, the show is to last two weeks, the first week having been devoted to road trucks and pleasure vehicles and the second to be devoted to industrial trucks and trailers. Accessories have been on exhibit this week and will be next. Evidence of the growing interest in secondary transportation by electrically propelled vehicles was given by the attendance at luncheon on Tuesday at the Hotel Astor, which brought out between four and five hundred people.

Arthur Williams, general commercial manager of the New York Edison Company, presided. He paid tribute not only to the electric vehicle industry but to Charles R. Skinner, manager of the company's vehicle bureau, to whose efforts the success of the show was attributed. The speakers at the luncheon were E. M. Cowie, vice-president of the American Electric Railway Express Company, the largest operators of electric trucks in the United States; F. H. Hotchkiss, who read a paper by Gerson Marks, assistant to the general manager of the New York, New Haven & Hartford Railroad, and J. E. Dann, president of the Pilgrim Laundry of Brooklyn. All the speakers bore testimony to the efficiency and economy of operation of the electric vehicle and foresaw a bright future for this means of secondary transportation.

"The electric vehicle," said Mr. Cowie, "is very dependable and its costs are reasonable. Replacement costs are less than for the gas truck; of far greater importance, however, is its smaller record of accidents and personal injuries in congested traffic than for any other kind of transportation. The 'electric' has all the speed consistent with safety and traffic regulations, while its upkeep is but 50 per cent that of the gas car. Gradually the electric truck is pushing the gas truck out into the long suburban hauls, while reserving the city transportation for itself."

Trucks and trailers for railroad freight terminal hauling were shown by Mr. Marks to be more economical in man-hours and more efficient in tons of material moved by from 50 to 100 per cent than manual trucking. He gave a number of operating figures.

Mr. Dann, who uses thirty-four electric trucks in laundry delivery service, gave as the monthly operating and maintenance expense, excluding depreciation, $20.39 per truck.

The exhibits at the first week of the show included a number of new cars and also the oldest "electric" in existence. The list of electrical exhibitors is as follows:

Pleasure cars: Detroit Car Company, Rauch & Lang, Inc.

Road trucks: Commercial Truck Company, Lansden Company, Inc.; O. B. Electric Vehicle, Inc.; Steinmetz Electric Motor Car Corporation, Walker Vehicle Company, Walter Motor Car Company.

Taxi cabs: Electrocar Corporation.

Storage batteries: Edison Storage Battery Company, Electric Storage Battery Company, General Lead Battery Company, K. W. Battery Company, Philadelphia Storage Battery Company.

Accessories: A. & J. M. Anderson Manufacturing Company, Allen-Bradley Company, Auto Electric Device Corporation, Corte Engineering Company, Cutler-Hammer Manufacturing Company, Electric Products Company, General Electric Company, Westinghouse Electric & Manufacturing Company, Sangamo Electric Company, Service Recorder Company.

General Electric Wins Another Injunction in Lamp-Patent Suits

THE Continental Lamp Works, Inc., 532 West Twenty-second Street, and the United Lamp Manufacturers Corporation, 44 West Eighteenth Street, New York, have been enjoined from manufacturing vacuum tungsten and gas-filled tungsten lamps, covered by the Langmuir and the Just and Hannaman patents, pending settlement of litigation, by the United States Circuit Court of Appeals on a petition filed by the General Electric Company. The Continental Lamp Works, Inc., were organized in February, 1920, and, it is alleged, have been manufacturing without license from the General Electric Company lamps of the gas-filled tungsten type, covered by the Langmuir patent, the property of the General Electric Company. The

SECOND ANNUAL ELECTRIC VEHICLE LUNCHEON ATTENDED BY MORE THAN FOUR HUNDRED PEOPLE

United Lamp Manufacturers Corporation was organized in July, 1921, and is said to be a consolidation of companies not licensed to use the patent in suit. It sells vacuum tungsten and vacuum carbon lamps.

As a defence the appellees adduced the act of the General Electric Company in selling to them lamp bases such as are used on lamps of the Langmuir type and thus impliedly granting a license to use the patent in question. The appellant showed that the contract of sale provided unmistakably that the sale of these bases conferred no license under any patents of the General Electric Company. The court below had sustained the contention of an implied license and had refused an injunction. However, the appellate division found the bases to have been a standard article of manufacture for a number of years before the Langmuir patent was granted. The General Electric Company stated that it had sold the bases only because of a desire to avoid certain unfair trade practices complained of by the government in 1911. In conclusion, the court stated there was nothing in the language or conduct of the appellant to justify the appellees in using the patented lamp with these bases and granted the injunction pending settlement of the suit.

Philadelphia Electric Reduces Rates

ANNOUNCEMENT was made last week by Joseph B. McCall, president of the Philadelphia Electric Company, of a reduction in rates, effective May 1, which will mean a saving to consumers of more than $1,000,000 annually. Residence and retail lighting rates will be cut from 9 cents-hour to 8 cents per kilowatt-hour maximum; retail power service from 8½ cents to 7½ cents per kilowatt-hour, maximum, and wholesale light and power service from 9 cents to 8 cents per kilowatt-hour for the first 500 kw.-hr. and from 7½ to 7 cents per kilowatt-hour for the next 1,000 kw.-hr. per month. The other schedules, which involve large users of power for industries, utility, railroad and other purposes are reduced by 1 mill per kilowatt-hour.

Mr. McCall, in discussing the reduction in rates and explaining its meaning, said:

This reduction, at the rate of more than a million dollars per annum, to our customers in this territory is approximately 5 per cent of the total bills written, the percentage varying with different schedules and depending upon the class of service. Putting it another way, this reduction really means an amount equivalent to 20 per cent of the net income of the Philadelphia Electric Company system.

Customers who are obtaining service under schedules of our tariff in which the coal clause is incorporated are now receiving and will receive, in addition to the 1 mill reduction, the benefits of lower prices for coal.

We are making the reduction because of our expectation of increased business during the rest of the year, the first three months of the year indicating that such an expectation is reasonable. In making this reduction we feel that this is the time to introduce the element of lower costs in production, in the belief that it may serve as a real stimulus for the industrial revival which should be hopefully anticipated by every one.

We have always shared our prosperity with the community which we serve, and we have always reduced our rates where such a reduction was possible without prejudicing the character of service we aim to furnish or our ability to finance additions to and extensions of our plants made continually necessary to meet the demands of such an industrial territory as Philadelphia and Delaware Counties. Making this reduction at the present time is a source of great gratification to us.

North American Company Acquires Interest in Cleveland Electric

NEGOTIATIONS have been concluded by the North American Edison Company, a new subsidiary of the North American Company, for the purchase by the former of the $7,763,500 common stock of the Cleveland Electric Illuminating Company, about 75 per cent of which was held by the Central States Electric Corporation.

In exchange for its holdings in Cleveland Electric Illuminating the Central States Electric is to receive $3,000,000, par value, or 60,000 shares of North American 6 per cent preferred stock and cash sufficient to pay off its $5,963,500 ten-year 5 per cent notes due June 1, 1922, besides a substantial cash balance available for purchase of new securities. It is understood that additional stock of the Cleveland Electric Illuminating Company will be acquired by the Central States Electric Corporation.

The North American Edison Company will have a capital of 200,000 shares, no par value, all owned by the North American Company. The new company will also take over all the outstanding common stock of the Union Electric Light & Power Company of St. Louis, which has heretofore been owned by the North American Company.

The new company has just sold an issue of $14,000,000 thirty-year secured sinking fund 6 per cent bonds, the proceeds of which will furnish the necessary cash financing in acquiring Central States holdings in Cleveland Electric as well as to pay off its notes.

S. E. D. Publication Schedule

A DEFINITE publication schedule of business-building aids and educational material for public distribution which the Society for Electrical Development has undertaken to produce and distribute during the next few weeks has just been announced. These booklets and monographs, which are being prepared by the staff of the Society, are in addition to "Do It Electrically," the monthly publication of the society. The announced schedule is as follows:

April 17.—"Editorial Suggestion Service," promoting good will for public utilities; distributed to newspapers and central stations.

April 20.—"Building Housewiring Business," a monograph giving details of how to obtain housewiring business.

April 20.—Sales helps for use in obtaining housewiring business, "ad" cuts, slides, letters, window displays, etc.

April 20.—"Why Is an Outlet?" a pamphlet for distribution to the public, promoting the idea of convenience outlets; first issued by the S. E. D. in 1918, revised and improved for 1922 use.

April 27.—"Partial Payment Plans," a monograph giving details of plans of time-payment financing.

May 2.—"Customers Versus Population," for Canada, showing percentage of wired homes in Canada.

May 5.—"Adequate Wiring Folder," a small folder for public distribution.

May 10.—"Appliance Selling Suggestions," a monograph of procedure, with details of successful campaigns.

May 15—"Editorial Suggestion Service to Newspapers and Central Stations."

June 5.—"Home Electrical Plans," a monograph on how to organize and conduct an "electrical home."

June 5.—Booklet for distribution to visitors at electrical homes.

June 15.—"Useful Information for Architects," revision of previous society publication.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Another Municipal Plant Gives Up.—The taxpayers of the village of Clifton Springs, N. Y., have voted to sell the municipal electric light plant to the Empire Gas & Electric Company for $15,000.

Cost of Electrification in Norway.—Short stretches of two Norwegian railway lines are to be electrified, according to reports to the Department of Commerce. Electrification planned on the Ostensjo line will cost $125,000 per kilometer, it is estimated, and work on the Sognsvand line $122,000.

New Orleans Company to Have New Power House.—Receiver O'Keefe of the New Orleans Railway & Light Company has, it is announced, effected arrangements with the security holders of the company for an extension of $1,100,000 in receiver's certificates, which will fall due April 1, 1922, and for the issuance of an additional $1,000,000 of certificates for a new power house and other improvements, including the installation of a 20,000-kw. generator and a new electrical distribution system.

Lafayette (Ind.) Plant Sold to Indiana Northern.—The Indiana Public Service Commission has authorized the Indiana Northern Gas & Electric Company to acquire the steam-electric generating plant of the Lafayette Service Company at Lafayette. The Indiana Gas & Electric Company bid in the plant at a chancery sale for $120,000. The commission in authorizing the acquisition of the property said it would not recognize the purchase price as a rate-making base, the property being probably worth more than what was paid for it.

Continental Electric Moves to Omaha.—The executive offices of the Continental Gas & Electric Corporation, formerly at Cleveland, Ohio, will be moved in the near future to Omaha, Neb. This company now operates electric light, gas, steam-heat and ice plants in more than 100 towns within a radius of 100 miles of Omaha. It has let a contract to the Henningson Engineering Company of Omaha for the construction of 150 miles of new transmission lines in Nebraska. This company now has 430 miles of transmission line, serving sixty-five towns, which are connected with the Nebraska Power Company's system. According to Vice-President Harvey, electrical service is given to 32,500 people and, although the company is only ten years old, there are 1,100 stockholders in Mr. Harvey's own territory.

France Plans High Dam.—A 340-ft. dam is one of the features of the scheme of hydro-electric development of central France backed by capitalists of that region and likely to receive government approval, according to a correspondent of the New York *Times*. The project comprises in all the construction of four dams, of which the one referred to would be the highest, and four electrical plants, at the estimated cost of 400,000,000 francs. The great dam would form a reservoir covering 404 acres, including the sites of eight towns. The plant at the base would be equipped to generate 150,000 hp.

Keeping in Touch with Air Expresses by Radio.—A device has been installed in the air-traffic control tower at the London air station consisting of an extension line from the wireless station so arranged that the wireless operator can "plug" the air-traffic controller through on the wireless telephone and thus reach an air express flying between London and the coast.

—From Wide World Photos

As soon as machines are in the air the controller is able to get into communication with them on the wireless extension. He can also guide the planes down to earth even if the whole district is shrouded in mist or fog. The photo shows the controller speaking by wireless telephone from the lofty control tower to an approaching airplane.

Utility Company to Distribute Hydro-Electric Energy at Halifax, N. S.—The Nova Scotia Tramway & Power Company has entered into a contract with the Nova Scotia Water Power Commission whereby the public utility company is to have entire charge of the distribution of the hydro-electric power developed at St. Margaret's Bay. The contract is for a period of thirty years. The distribution of this power has long been a subject of contention, and there was strong support for a plan whereby the Halifax City Council would undertake the distribution. The contract provides that up to 18,000,000 kw.-hr. annually is to be delivered at the tramway's power station in Halifax at cost. The tramway company in turn must sell power to the city government at actual cost. Power for private use is to be sold at rates approved by the Public Utilities Board. The distribution of this new power for private use in Halifax and vicinity will begin in May.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month

National Electric Credit Association.—This association will meet at Detroit on Thursday and Friday, May 18 and 19.

Canadian Electrical Association.—The thirty-second annual convention of this association will be held in Ottawa, Ontario, on June 15 to 17, at the Chateau Laurier.

International Association of Municipal Electricians.—Preliminary arrangements for a four-day convention this summer of the International Association of Municipal Electricians at New Bedford, Mass., are being made under the direction of William P. Briggs, New Bedford, chairman committee on arrangements. Meetings are scheduled for Aug. 22 to Aug. 25.

Safety Switch Congresses.—The success of the first safety switch congress, held in Pittsburgh on Jan. 21 last, has stimulated interest in the other displays to be held in the various sections of the Association of Iron and Steel Electrical Engineers. On April 8 there will be a safety switch congress at the Hotel Statler, Cleveland, from 1 p.m. to 8 p.m., followed by a technical session, and on April 22 a similar meeting will be held in the Atlantic Hotel, Chicago.

Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. Section Meetings—Cleveland, April 10; Pittsburgh, April 15 and 22; Philadelphia, April 18.
A. I. E. E. Spring Convention—Chicago, April 19-21.
Tri-State Water and Light Association—Spartanburg, S. C., April 19-21.
American Physical Society—Washington, April 22.
American Electrochemical Society—Baltimore, April 27-29.
Missouri Association of Public Utilities—Columbia, Mo., May 4-6.
A. S. M. E. Spring Meeting—Atlanta, May 8-11.
Florida Engineering Society—Daytona, Fla., May 15-16.
N. E. L. A. Annual Convention—Atlantic City, May 15-19.
National Electric Credit Association—Detroit, May 18-19.
Electrical Supply Jobbers' Association—Hot Springs, Va., May 24-26.
N. E. L. A. Geographic Divisions—Southwestern, San Antonio, May 3-6; Pacific Coast, Los Angeles, May 31-June 3; Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15.
Electric Power Club—Hot Springs, Va., June 5-7.
Canadian Electrical Association—Ottawa, Ont., June 15-17.
Associated Manufacturers of Electrical Supplies—Spring Lake Beach, N. J., June 19-25.
American Physical Society, Pacific Coast Section—Salt Lake City, June 22-24.
A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30.
American Society for Testing Materials—Atlantic City, N. J., June 26-July 1.
Ohio Electric Light Association—Cedar Point, Ohio, July 11-14.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Service Must Not Be Abandoned.—The Oklahoma Corporation Commission has refused to permit the abandonment of service to sixteen customers of a gas company, this service being rendered at a heavy loss. The commission found the service mains to be in leaky condition and ordered repairs to be made, which it held would reduce the loss to a reasonable amount.

Equalizing Cost of Service.—An equal distribution of the cost of maintaining line service is sought through an order of the Oklahoma Corporation Commission, which affects electric rates in ten towns and adjacent oil fields served by the Oklahoma Gas & Electric Company. The order does not increase rates in these towns as a whole, but readjusts them so as to make the rates uniform in all the places served, the commission finding that some communities were not bearing their just share of the cost of maintaining service.

Companies Must Present Complete Case.—Officers of a public utility seeking increased rates should, the Nebraska State Railway Commission has announced, state definitely their conclusions as to the company's needs or as to the rate schedule which they regard as necessary for the future, together with supporting data. "It is not the commission's task to assume management of the internal affairs of the company," the announcement says, "determine questions of policy and reach conclusions as to rate schedules which are necessary. This is the company's responsibility, and while the commission is entirely willing to confer upon problems of the moment, it refuses to have delegated to it duties which are so obtrusively and manifestly the company's."

Ratio of Capital Expenditure to Revenue in Service Extension.—The Idaho Public Utilities Commission, which purposes to frame a comprehensive rule governing service extensions when its valuation of the Idaho Power Company for rate making shall be completed, has in the meantime ordered that the company shall be required to make an immediate capital expenditure for each new customer in an amount not exceeding twice the estimated annual revenue from such customer. Under the existing rule the company has been required to spend only the amount of the estimated annual revenue, any further expenditure requisite to service having to be advanced by the customer. "An extension rule," the commission observes, "not only requires the utility to make extensions in all proper cases, but is also a necessary means of protection for those who already have the service. Unreasonable and excessive investment for the benefit of new customers, if permitted, would adversely affect the rates of the old customers."

Abandonment of Unprofitable Territory Without Commission's Consent Forbidden.—The Public Service Commission of Pennsylvania has refused to allow the United Natural Gas Company to cease to supply a certain part of its territory. The company pleaded that this power had been lodged in natural-gas companies for thirty-six years. The commission holds that natural-gas companies are in the same relationship to it as all other public utilities and that its consent is a prerequisite to any curtailment or enlargement of territory. More than 600 consumers, the commission pointed out, who had equipped their premises for the use of natural gas on the implied assurance that they could depend upon its continued supply would be deprived of service were the proposed abandonment to be authorized.

Dilemma Presented by Rural Rates in Overbuilt Territory.—In an order reducing the rates of the Molalla Electric Company the Oregon Public Service Commission said: "It seldom becomes the duty of a commission to consider a problem where the conditions are more unfavorable for the establishment of rates to yield an adequate return than in the present instance. The evidence in this case shows that the company's system is largely overbuilt in the rural communities and embraces large areas of sparsely settled territory. The burden resulting from such improvident capital investment must fall upon the company and not upon the consumers generally. The commission realizes that the rural rates now effective do not provide an adequate return. However, a rate must not exceed the value of the service."

Confiscatory Rates Not Justifiable Because of Post-War Readjustments.—Declaring that public utilities cannot be required to accept confiscatory rates during the post-war price-readjustment period, the Utah Public Utilities Commission, in fixing rates for the Telluride Power Company, said also that it would be unfair to future customers of the utility to make rates too low to permit of the renewal and replacement of property, since this would mean that the present class of customers would escape a just obligation and that the burden of continuing the plant would be thrust upon future consumers. A public utility, moreover, should be allowed a return sufficient to enable it to compete for money for investment in extensions; but an electric company must forego a full return upon new property constructed in sparsely settled districts, although consumers in these districts cannot expect that service can be rendered them at a rate comparable with rates effective in centers of population.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Supreme Court of United States Upholds Pennsylvania Commission.—A contest waged by the borough of Edgewood, Pittsburgh, Pa., against the Public Service Commission of Pennsylvania and involving the power of the commission to annul a contract made by the borough has been decided by the United States Supreme Court in favor of the commission.

Commissions Bound by Definitions in Statutes Creating Them.—Contending that to every word, phrase, clause and sentence in a statute must be given a meaning, if it is possible to do so, and that it is competent for a legislative body to adopt restrictive definitions if it chooses to do so, the Supreme Court of Montana has found (State ex rel. Thacher vs. Boyle) that an irrigation company is not a public utility subject to the jurisdiction of the Public Service Commission of that state in the meaning of the law creating the commission. (204 Pac. 378.)*

Powers of Commission and of Municipalities in Ohio.— Reversing an order of the Public Utilities Commission of Ohio fixing telephone rates in the city of Columbus, in a suit brought by that city against the commission, the Ohio Supreme Court found that, although the commission, in approving a telephone merger, could require as a condition a reduction in rates, it could not bind a city not a party to the consolidation proceedings to an increase over the maximum fixed by contract between the city and one of the companies, the Ohio Public Utilities Commission not being authorized to change a contract rate. (133 N. E. 800.)

Party Participating in Inquiry Cannot Complain of Lack of Notice.—The Public Service Commission of West Virginia is not, the Supreme Court of Appeals of that state has determined, in Baltimore & Ohio Railroad Company vs. Commission, confined to the immediate scope of the pleading, and where the party whose interests were affected was before the commission, participated in the inquiry and made full defense, it is not entitled to complain of lack of notice or departure from the pleadings. An enforced discharge by a railroad company of its duty to provide reasonably adequate facilities for serving the public does not, the court further held, violate the Fourteenth Amendment merely because it is attended with some expense. (110 S. E. 475.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Edward B. Craft has been appointed chief engineer of the Western Electric Company. A prominent figure among the younger generation of America's electrical engineers and a leader in the development of the telephone and telegraph systems of the United States, Mr. Craft in his new capacity will

E. B. CRAFT

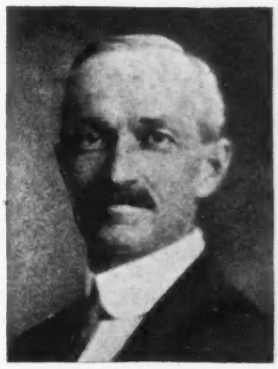
direct the efforts of more than 2,820 engineers. Mr. Craft joined the Western Electric Company twenty years ago as a development engineer, and more than sixty patents on telephone apparatus have been granted to him. In 1917 he became assistant chief engineer in charge of development and design, playing an important part in the design of the so-called mechanical switching telephone-exchange system. In 1917 he was commissioned captain in the Signal Officers' Reserve Corps and was assigned to the consulting engineering division of the Signal Corps, being soon afterward promoted to the rank of major. In the summer of 1918 he was sent abroad on behalf of the Bureau of Steam Engineering of the navy to carry on consulting engineering work in connection with radio communication. Mr. Craft's new appointment is the result of a reorganization of the administrative department of the Western Electric Company. Dr. F. B. Jewett, vice-president of the company, who preceded Mr. Craft as chief engineer, is now in charge of the telephone department, which includes the engineering, telephone sales and manufacturing departments.

F. M. Mason, chief engineer of the Central Maine Power Company, was elected president of the Maine Association of Engineers at its annual meeting, recently held in Augusta. Mr. Mason is a graduate of Rensselaer Polytechnic Institute and for the past fifteen years has been connected with some of the largest power developments in the State of Maine. One of his most recent engineering accomplishments was the completion of the North Channel Dam at Skowhegan, which is considered one of the finest dams in New England. Mr. Mason is a member of nearly all the national engineering societies.

F. D. Emory has been promoted to superintendent of operation and maintenance of the British Columbia & Alberta Power Company, Ltd., and assumed his duties on Feb. 1. Mr. Emory comes to his new position after some thirteen years of experience in the operation of various public utilities in Canada. He began in 1909, when he became connected with the Winnipeg (Man.) Electric Railway Company in the construction and operation of its hydro-electric plant at Lac du Bonnet. After a year of such work he entered the Bliss Electrical School in Washington, D. C., and was graduated in 1911. Following six months of construction work on the Pacific Coast, he spent about two years with the engineering department of the Canadian Westinghouse Company. In 1913 he was appointed assistant superintendent of the Northern Ontario Light & Power Company and was later assistant manager of the Winnipeg offices of the Fenanto Electrical Company of Canada. He was city electrician and engineer of Kaslo, British Columbia, from 1915 to 1918, after which he entered the employ of the Electricity and Gas Inspection Services of the Dominion of Canada in the Nelson district as district inspector.

Lyle A. Whitsit, formerly of the engineering staff of the Superpower Survey as principal assistant in the division of power and transmission, has recently been appointed to a position with the Adirondack Power & Light Corporation of Amsterdam, N. Y. He will make various studies relative to load and operating conditions and proposed extensions of generating and transmission equipment. Mr. Whitsit is a graduate of Michigan University and after graduation spent four years in structural steel work and design. He then entered the employ of the Aluminum Company of America as resident electrical engineer on the Massena (N. Y.) power development. Subsequently he served in an administrative capacity as district engineer of the United States Forest Service on water-power development, and still later as captain of engineers on the War Industries Board. This work consisted of a study of the economic and operating advantages of the interconnection of electric power systems in western Pennsylvania and eastern Ohio and in the Southeastern States. After the war Mr. Whitsit was sent to Japan by the Aluminum Company of America to make power studies. His work on the interconnection of power systems was continued in the Superpower Survey.

Herman Russell, general manager of the Rochester Gas & Electric Corporation, was elected a vice-president of the company at a meeting of the board of directors held on Feb. 14. Mr. Russell comes to his new position after some twenty years' experience in the operation of public utilities, and his latest



HERMAN RUSSELL

advancement is the logical recognition of managerial ability of a high order. He was born in Manistee, Mich., in 1878, and was graduated from the University of Michigan in 1898, taking a post-graduate course in chemistry and gas engineering, for which he received a master's degree in 1900. After leaving college Mr. Russell immediately entered public utility work in the employ of the Detroit Gas Company, and in 1902 he was promoted to become assistant superintendent of that company. This position formed a stepping stone to that of superintendent of the gas-manufacturing department of the San Francisco Gas & Electric Company, a position which he filled from 1903 to 1904. The Gas & Electric Company of Cincinnati appointed him assistant superintendent of gas manufacture in 1904, after which he became connected with the Rochester Railway & Light Company as assistant superintendent of gas works, and in 1906 he was made superintendent of gas manufacture for that company. With the increasing growth of the company and the consequent need for expansion in the management, Mr. Russell was again promoted and became assistant general manager in 1914, from which position he was advanced to that of general manager of the company in February, 1919.

J. D. A. Cross, until recently manager of the appliance sales department of the Edison Electric Appliance Company, is now vice-president in charge of sales of the Rutenber Electric Company, Marion, Ind. Mr. Cross has been connected with the General Electric Company and its subsidiaries for the past twenty-six years, starting in Schenectady in a clerical position. Later he was transferred to Chicago and covered the territory of Indiana, Illinois and Iowa as general supply salesman until 1907. At that time he was made heating-device specialist for the entire Chicago district. In 1916 he was put in charge of the heating-device sales department of the General Electric Company, with headquarters at Pittsfield, Mass., and when the Edison Electric Appliance Company was formed on Jan. 1, 1918, was made manager of the appliance sales department of that company.

J. D. A. CROSS

W. A. Bersch, comptroller of the S. F. Bowser Company, Inc., Fort Wayne, Ind., has recently been elected a member of the board of directors of that company.

Reginald M. Campbell, formerly with the Habirshaw Electric Cable Company, has become a member of the sales organization of the American Copper Products Corporation, New York, and will have his headquarters at the New York office of the company.

Horace F. Kite has been appointed by the Incandescent Supply Company to manage its St. Louis jobbing house, now being opened. Mr. Kite, originally from Norristown, Pa., has devoted virtually all of his business life to sales work. At first he was city salesman for the New York office of the American Brass & Copper Company, and later he was manager of its Chicago office. In November, 1921, he resigned to become connected with the Incandescent company, and he received the new appointment about a month ago. In this capacity he will direct the sales of the company in the entire Southwest territory.

H. J. Grosvenor has been appointed secretary-treasurer of S. F. Bowser & Company, Inc., Fort Wayne, Ind. Mr. Grosvenor has been with the company twenty-one years, starting as bookkeeper.

Noel Cunningham, formerly connected with the Coal Washing Equipment Company, has become associated with the Hardinge Company, New York City, and will take charge of the new department created by the acquisition by the Hardinge Company of the manufacturing and sales rights of the James coal-washing equipment.

T. K. Quinn, formerly manager of the credit department of the National Lamp Works of the General Electric Company, has been appointed manager of the miniature-lamp sales department, succeeding P. F. Bauder, who resigned that position on account of ill health but is still with the company. Mr. Quinn will continue to supervise the activities of the credit department. He joined the National Lamp Works organization in 1911 with the Cleveland Miniature Lamp Factory. Two years later he entered the large lamp sales department and in 1915 joined the credit department. He became manager of this department in 1917.

Victor M. Arana has recently been made chief engineer of the Empresa de Trabajos Electricos, a newly organized commercial, manufacturing and contracting firm, Casilla del Correo 64, Lima, Peru. Mr. Arana was graduated in electrical engineering at the University of Notre Dame, in 1904. After spending nearly two years as draftsman for the Buffalo Forge Company, the Babcock & Wilcox Company and also as instructor in electrical engineering at the University of Maine, he sailed for Peru, where he has been established ever since. In 1911 he was appointed head of the electrical department in the National School of Arts and Crafts and subsequently chief engineer and commissioner of public services for that country. After spending about eight years in the above positions, where he organized and directed these institutions on modern lines with American standards, he decided to open a consulting and contracting office in Lima. In the last three years he has exerted a powerful influence in behalf of the American importers, helping to counteract the long-established hold of German electrical interests. The new electrical organization to which Mr. Arana will devote his main energy is a general importing, manufacturing and contracting firm. He will also give much of his time to association and editorial activities. He has held the position of main editor of the bulletin of the Sociedad de Ingenieros, the representative engineering publication of Peru. Mr. Arana, who in 1912 became an associate of the American Institute of Electrical Engineers and in 1919 was transferred to the grade of member, is now actively organizing an American electrical clu

Charles H. Talmage, who has been field secretary to the Rocky Mountain Electrical Co-operative League for the past six months, has resigned that position to return to the Western Electric Company as manager of the Omaha branch. His successor has not yet been appointed. Mr. Talmage has been in the electrical field more than twenty-three years. He was born on an Iowa farm in 1875, and his first electrical association was in 1898, when he joined the Advance Electric Company of Indianapolis as treasurer. In 1901 he resigned to become associated with the Western Electric Company as traveling salesman, covering the Illinois territory and later taking a desk in the Chicago office. In 1904 he was transferred to the Kansas City office of the Western Electric Company, where he acted as sales manager until 1917, when he was promoted to be manager of the company's Salt Lake City office. In the summer of 1921, after having completed twenty years of service with the Western Electric Company, he accepted the position he has just resigned.

C. H. TALMAGE

D. G. Milligan, formerly treasurer of S. F. Bowser & Company, Inc., Fort Wayne, Ind., has been appointed director of foreign sales.

P. S. Richter, superintendent of several departments of the Yale & Towne Manufacturing Company, Stamford, Conn., will also have charge of the industrial electric truck department and the door closer and hoist departments, which were consolidated recently.

J. R. L. Glover, who has been connected with the Bridgeport Brass Company for the past six years, has been appointed sales engineer on brass and copper pipe and piping. Mr. Glover entered the employ of the company as a laborer shortly after being graduated from Yale University. He served in the United States Air Service in France during the war and when peace was declared re-entered the employ of the Bridgeport company in the sales department. Until recently he promoted sales of the company's trolley wire.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Considerable Improvement Noted in Basic Industries

CONDITIONS in basic industries have, with a few exceptions, shown enough improvement since the first of March to warrant moderate optimism. Production of pig iron, steel ingot and structural steel gained during the month after a very mediocre start. Just at the end of the month Carnegie steel started operations on a basis of close to 100 per cent. Steel quotations were pushed up toward the end of the month, and, what is more important, producers have been successful in maintaining the new levels. Buyers have been forced to protect their lower price options, and the result is a large gain in unfilled orders. Much more steel is going to automobile manufacturers, who were very active in March, and the railroads are still active in the market. The advance in building was consistent all over the country.

There were favorable developments in agriculture, winter wheat being good and a larger acreage of cotton being planned for the coming season. Agricultural machinery is experiencing better demand. The movement of commodities to market was better, an increase in car loadings being noticeable in many parts of the country. Lead and zinc mining has improved, and though copper prices have weakened, the statistical position is still good and the porphyry group of mines has reopened. There has been little change in finance with the exception of a slight thawing out of "frozen" credits in the South and West. Lumber production jumps week by week.

Manufacturing has about held its own, though jobbing and retailing have dropped slightly. This is explained by the usual "between-season" slackness. Two conditions have acted to offset all this improvement. They are the coal strike and the strike of textile operatives. Neither is considered as seriously detrimental yet, but both act as a drag on the business bandwagon. All in all, however, the period since March 1 may be regarded as one of distinct improvement.

Control Equipment Manufacturers Report Better Market

BETTER industrial conditions are seen in reports from several large manufacturers of control apparatus, and an even greater increase in activity is forecast for the next six months on the basis of orders now in hand and inquiries being received. Six months ago sales were very quiet, and it was almost an accepted fact that most industrial plants were much overequipped for any business which would develop within the next year or so. Nevertheless, an improvement in sales was noted late last fall, and since the first of the year bookings have increased at a very satisfactory rate.

One large manufacturer estimates the increase in orders over six months ago as approximately 40 per cent, and while others are more conservative in their reports, all agree that the slowest period has been passed. There have been many requests lately for engineering suggestions on new equipment, and many of these undoubtedly will be translated into terms of orders before the end of the summer. Inquiries for quotations also are being received in satisfactory volume.

Much hope is pinned on the improvement in the metal manufacturing and producing industries, which gained considerable momentum during March. Steel-ingot production, pig-iron production, structural-steel contracts and the unfilled orders of the United States Steel Corporation have all gained, and prices of many steel products were advanced on April 1. Exports of steel increased during that month, and all this activity means that more electrical equipment will be put to work in the mills.

Deliveries of control equipment have got back to normal since most of the producers are working at only part capacity. Shipments of special-type equipment are being based on the time necessary for manufacture. Prices have not been cutting quite so important a figure in this industry as in many branches of the electrical trade and are now estimated at from 10 per cent to 15 per cent below the peak. It is stated by the manufacturers that there is nothing in their manufacturing costs which would justify any reductions at the present time.

Collections Generally Good with Sectional Improvement Shown

COLLECTIONS and credits in the past month and a half have shown no violent change, though some sections are seeing things more rosily than others. The characteristic of the situation now is the desire to catch up, whereas six months ago it was a desire to put off payment as long as possible. This change in the frame of mind of retailers and jobbers is encouraging, even though for the present it does not actually reduce the average time of collections. Several manufacturers and jobbers in the metropolitan district of New York report many of their overdue accounts being reduced bit by bit and are more confident than they were on the first of the year. This is not to say that credits are being watched any the less closely.

A better tone in collections is apparent in New England. The outstanding accounts of representative jobbers are being settled in their favor in from sixty to seventy days. In some cases back accounts in excess of the monthly statements sent out are coming in, showing a gratifying "taking up of slack" in handling these obligations. Central-station outputs are better than last year in not a few cases; general manufacturing and building are looking better despite textile strikes, and banking conditions are more favorable. Retail trade is off somewhat, but money is moving more easily and the electrical industry is sharing in the improving financial situation.

Collections taken as a whole are reported slow in the Southeastern States, and considerable effort is required to collect outstanding accounts within the allotted period. Some firms report they are filling only a percentage of the orders received, rather than extending further credit to those who have demonstrated that they are unable to make satisfactory payments on outstanding accounts. It might generally be said that collections in the rural districts are slower than in the cities, owing to the fact that the rural population is using such funds as are available for the purchase of farm implements, fertilizer and other necessities for agricultural purposes. This condition will, undoubtedly, continue until some of this year's crops are available for the market.

In the Middle West conditions show few changes and the average is between sixty and sixty-five days. More

dealers than formerly are discounting their bills, but the percentage that takes advantage of every minute of time that will be granted is still large. In the Southwest jobbers report credit conditions virtually unchanged. Collections are on a basis of about sixty days. Money is tight in the small country banks because of the agricultural conditions, and this has some effect on the money conditions of the city banks. The latter, however, are lending now more liberally and money rates are substantially lower than eighteen months ago. However, the increased sales to dealers for replenishing stocks and for meeting the increased demand tend to make collections somewhat slower.

Collections on the Pacific Coast were not quite so good as for the preceding three months, though they are not considered bad. The average days outstanding for the month of March were between forty-five and fifty. The situation seems to be improving and accounts are getting on a better footing. The credit situation is easing up and will continue to do so from present indications.

Southwest Wiring Material Orders Still Small, but Demand Increases

A REPRESENTATIVE manufacturer of wiring material whose trade takes in much of the territory in the West and Southwest reports that though building of residences and commercial structures has been going ahead steadily sales of electrical materials are still on a hand-to-mouth basis. Almost all orders are small and seem to include barely enough for one or two small jobs, but there are many of these orders and the volume at the factory is not to be despised. There is one advantage in this small-order large-volume business as far as the manufacturer is concerned, and that is a smaller total discount given on all the business done.

Demand is increasing week by week, says this manufacturer, and has already passed the mark of a year ago. There is a more noticeable confidence in the Southwest, resulting from a better oil market, higher-priced cotton and wool and gradual stabilization of live-stock prices, and construction of residences should be greater this spring than ever before in the territory southwest of the Mississippi River. The demand should reach its peak at the factory, said this manufacturer, in July and August and should continue well into fall.

Of wiring materials in general jobbers have fair stocks, while contractors have been ordering cautiously. Manufacturers have good supplies and are prepared to ship in quantity so that there is little danger of a shortage. Producers are finding it easy to obtain raw material, and, taken all in all, this branch of the industry is in a comfortable position to wait for the opening up of building in the Southwest.

German Electrical Exports Not Alarming

EXPORTS from Germany during 1920 and part of 1921 were not large enough to cause much alarm to American manufacturers, according to figures just obtained by the Chamber of Commerce of the United States. A table giving those figures applying to electrical manufacturers is printed here. The table indicates that not a single German electrical product was shipped to the United States. It is believed in electrical circles here that the figures supplied by Germany are somewhat inconclusive on this point and that moderate quantities of German-made electrical goods have entered this country since the war.

The figures for 1920 show a decrease from 1913 of about 70 per cent in dynamos, motors and transformers, approximately 55 per cent in electric cables, 35 per cent in electrical apparatus for lighting, power and electrolysis, over 50 per cent in lamps and 75 per cent in copper manufactures. South America, it will be seen, proved a fairly good customer for lamps, dynamos, motors and transformers, but sales were made in the main to the countries which lie close to Germany.

PRINCIPAL ELECTRICAL EXPORTS FROM GERMANY BY TONS* FOR 1913, 1920 AND MAY-AUGUST, 1921.

Commodities	1913	1920	May, 1921	June, 1921	July, 1921	Aug., 1921	Exported in 1920 Chiefly to
Electric dynamos, motors, transformers	41,889	12,352	839	1,278	910	944	Neth., Aus., S. Amer., Sw., Sp.†
Electric cables	47,591	22,422	1,506	1,690	7,494	4,250	Neth., Nor., Den.
Electrical apparatus for lighting; power and electrolysis	24,874	15,205	1,066	840	1,180	1,157	Neth., Nor., Switz, Den., Sw.
Electric incandescent lamps	2,349	1,217	87	74	59	94	S. Amer., Nor., Sw., Den.
Manufactures of copper	84,755	21,581	2,250	2,454	3,560	3,406	Neth., Switz., S. E. Asia.

* Quantities are expressed in metric tons (2,204.6 lb.)

† Abbreviations: Aus., Austria; Den., Denmark; Fin., Finland; Neth., Netherlands; Nor., Norway; S. Amer., South America; Sp., Spain; Sw., Sweden; Switz., Switzerland; S. E. Asia, Southeast Asia.

According to a recent report to the United States Department of Commerce, German exports of electrical goods among other commodities showed an increase in December, 1921, over the previous month.

Metal Market Situation

THE copper market remains inactive with a small amount of domestic inquiry to be found, while buying is negligible. Foreign buying also has been small for the past week. As a result of the stagnation in the market a weakening tendency remains noticeable, and the metal is reported to be obtainable in moderate lots at 12¾ cents per pound for April shipment. The larger producers are still quoting 12¾ to 13 cents for prompt delivery and apparently are willing to sit back until the slack is taken up.

The opening of the porphyry group of mines is apparently one reason for the dearth of buying, consumers waiting to see how the added production will affect the market. The companies include Utah Copper, Ray Consolidated, Nevada Consolidated and Chino Copper. These companies have been closed down for more than a year. Officials of the finance committee of the companies in discussing the action said it was justified in view of the fact that the companies' selling agents have disposed of all supplies on hand for delivery over the next three months.

That this production will soften the market is doubtful, for production at present is well below demand and stocks for both export and domestic consumption are not very large. Consumption is increasing here, brass manufacturers and wire drawers reporting good orders and inquiries, and foreign consumption is holding its own. Probably the underlying reason for lack of buying now is that domestic consumers have hardly been able to cut deeply into the commitments made during the last three months of 1921.

NEW YORK METAL MARKET PRICES

	March 28, 1922	April 4, 1922
Copper:	£ s. d.	£ s. d.
London, standard spot	57 12 6	57 2 6
	Cents per Pound	Cents per Pound
Prime Lake	12.87½	12.75
Electrolytic	12.62½	12.75
Casting	12.37½	12.50
Wire, base	13.87½–14.12½	13.87½–14.12½
Lead, Am. S. & R. price	4.70	4.90
Antimony	4.40	4.50
Nickel, ingot	41.00	41.00
Sheet zinc, f.o.b. smelter	7.50	7.50
Zinc, spot	4.97½	5.05
Tin, straits	29.25	29.37½
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	10.75 –11.12½	11.00 –11.37½
Brass, heavy	5.00 – 5.50	5.00 – 5.37½
Brass, light	4.75 – 5.00	4.75 – 4.87½
Lead, heavy	3.75 – 3.87½	3.75 – 3.87½
Zinc, old scrap	2.37½– 2.60	2.25 – 2.50

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

BUSINESS in general showed improvement last week, though there does not seem to be much confidence in its ability to continue the pace. Prices remained on their former levels all week with a few minor suggestions, and demand for a number of items was unusually strong. New England central-station companies are buying more line material and jobbers also enjoyed better sales on tableware appliances. The textile strike seems to be unabated there. The Federal Reserve Bank report for Atlanta and the remainder of the sixth district notes business progress and announces a cut of one-half of 1 per cent in its rediscount rate. There is a fair movement there of wire and high-tension transformers. The coal strike has brought St. Louis jobbers a temporary increase in orders for electrical equipment for the Illinois mines, but sales to other customers increased also.

There has been a marked improvement in Chicago jobbing business and a constantly increasing demand for wiring materials. The general trend around Portland and Seattle is toward normal, and the lumber market is improving so rapidly as to necessitate bigger operations soon. San Francisco retailing has slowed up slightly. The opening of more copper mines has made the Intermountain country optimistic.

NEW YORK

Some improvement in the electrical trade was noted this week. Continued favorable weather has given further impetus to building activity, and this is being reflected in an increased demand for wiring supplies. Jobbers state that orders are coming through for larger quantities; but no exceptionally large purchases are being made. Generally there is a very optimistic sentiment throughout the trade, and a steady increase in business is looked for.

No important price changes were reported this week, although there has been some stiffening in quotations on certain items which have been the medium of special inducements to obtain business on a competitive price basis. The new prices on lamps do not seem to have stimulated sales, but this could hardly be expected at this season of the year. Stocks are good as a rule and ample to meet the present conservative buying.

Little apprehension is felt in this section regarding the adverse effect which the coal strike might have on the electrical trade as its possible influence on local conditions has already been discounted.

Rigid Conduit.—Only a fair demand for this material is reported and moderate stocks are carried. The following quotations show no change since last week. For ½-in. black pipe in 2,500-ft. lots, $44.50; ¾-in., $58.10, and 1-in., $82.79 per 1,000 ft. Galvanized pipe in the same sizes and quantities was quoted at $50, $64.50 and $92.20 per 1,000 ft.

Rubber-Covered Wire.—No change in price or conditions in the wire market was reported this week. A moderate demand for No. 14 is apparent. This size is selling around $6.25 to $6.50 per 1,000 ft. in 5,000-ft. lots.

Flexible Armored Conductor.—A good steady demand for armored conductor is reported by all jobbers. No change in price has been announced by the manufacturers, but quotations have stiffened during the past week. No. 14, two-wire, single-strip, ranges from $43 to $45 per 1,000 ft.

Loom.—Only a moderate demand is reported. In 1,000-ft. lots the ⅜-in. size sells for $14.50 per 1,000 ft. and the ½-in. size is quoted at $16.20 per 1,000 ft.

Lamp Cord.—Fair sales are reported, with jobbers' stocks in good condition. No. 18, cotton, twisted, is quoted at from $11.65 to $12.75 per 1,000 ft. No. 18, cotton, twisted, parallel, is quoted at $14.50 to $15.45 per 1,000 ft.

Appliances.—Flatirons and toasters are the best sellers of the heating devices, and jobbers report satisfactory activity. Intensive selling effort is producing good results on vacuum cleaners, while washers continue rather sluggish.

Metal Molding.—A slight drop in this material was recorded this week. The three-wire size now sells for $50 per 1,000 ft. in that quantity, as against a price of $52.50 to $55 formerly. "Wiremold" is quoted at $38 per 1,000 ft. in 1,000-ft. lots.

Radio.—There is no let-up in the demand for radio apparatus of all kinds. Jobbers are unable to build up stocks, and they have many unfilled orders on their books. Prices on some coils, tubes and complete sets have been advanced from 3 to 5 per cent.

CHICAGO

A marked general improvement in the electrical business has been noted during the past week. Although every day of the week was rainy, jobbers reported a better movement of wiring materials. The variance in the price of flexible armored conductor and rigid conduit still exists, but these materials are also moving well. The call for bare wire, especially No. 14, is continuing, owing to radio use. Better interest in household lighting fixtures has been shown this past week than during any week of March, and jobbers feel that with the spring residential building a better fixture business can be expected.

Wire.—An improved market for No. 14 rubber-covered wire was noticed during the week. The price is still around $6.25 to $6.35 per 1,000 ft. in 5,000-ft. lots and stocks are ample. The call for No. 14 bare wire is sustained by the demand for copper to be used in building radio sets. Sales of weatherproof wire have been steady but individually small. Prices of these two commodities have not changed.

Conduit.—Jobbers state that the call for conduit has increased, but prices still vary, and the ½-in. black pipe in 5,000-ft. lots sells for $41, the ¾-in. for $52 and the 1-in. for $73 per 1,000 ft. Galvanized pipe in the same sizes and quantities is quoted at $46.50, $57.70 and $81 per 1,000 ft.

Flexible Armored Conductor.—The demand for this material is continuing and stocks are not excessive. The double-wire, single-strip, sells for $42.50 per 1,000 ft. in 5,000-ft. lots and the double-strip for $45 in the same quantities.

High-Tension Equipment.—An increase in business on outdoor and indoor switching and control equipment has been reported for the week by one manufacturer. Another company states that it has received orders for a 7,500-kva., 33,000-volt and a 600-kva., 22,000-volt outdoor substation, the former for an Indiana utility and the latter for a company in the Northwest. One company tells of a good business in outdoor equipment and is quoting on installations for companies in the Northwest and the Southeast.

Lamps.—A price reduction of about 10 per cent on nearly all types went into effect on April 1. While all lines are moving well, the mill-type seems to lead, possibly because of replacement of the old carbon type by the railroad and industrial companies. The gas-filled bulb is also selling well. For home and theater lighting there seems to be a pronounced demand for the new golden-glow lamp.

Dry Cells.—The demand for dry cells is steady because of radio requirements. The standard cell is quoted at $30.55 per barrel in barrel lots.

Fixtures.—While March business in fixtures has been sluggish, dealers feel that improvement has begun since the past week has seen better activity in the standard household fixture. Inquiries are also increasing.

BOSTON

Business holds up remarkably well considering the extent of curtailment in the textile field resulting from strikes. Building activities are increasing rapidly, and for the week ended March 28 the total of New England contracts was $6,546,800, compared with $2,770,600 for the same week last year. Jobbers are still buying from hand to mouth in most lines. Prices are lower on lamps, without much change in other lines. Central-station buying of line material is increasing somewhat. So far the coal strike has had no apparent effect on business in this district, ample stocks for two to four months' consumption being noted in many localities. Central-station earnings are running well ahead of last year's in not a few companies. Stocks are being maintained in some quarters on the basis of thirty days' requirements. Appliance sales are improving somewhat in the tableware lines.

Motors.—The demand for small motors is increasing slowly and inquiries are much more active. No difficulty is reported in obtaining deliveries. One distributer found last month's business better than February's and ahead of the same month last year.

Wire.—Light demand features the market, No. 14 rubber-covered selling at $6.25 per 1,000 ft. in 5,000-ft. to 25,000-ft. lots. Weatherproof base is 16 cents, with moderate sales. Very close competition is apparent.

Lamps.—Prices were reduced on an average about 10 per cent April 1 on various sizes and types of lamps, with the exception of the 75-watt type C, which continues steady. Lamp sales are holding up remarkably well.

Pole-Line Material.—Line hardware is moving a little more actively and small-lot sales of cross-arms are reported. In less-than 100 lots 3 ft. long-leaf yellow-pine arms sell at 40 cents each and 5½-ft. arms at 80 cents.

Fans.—Buying for stock for early seasonal distribution is under way in some establishments, but as yet little interest in fans is apparent in retail buyers' orders.

Porcelain.—There is little activity in either "Nail-it" knobs or tubes. The former are selling at $15.50 per 1,000 in barrel lots. Increased building construction will probably be reflected by a better demand in the near future.

Radio Equipment.—The demand for wireless telephone apparatus grows greater from day to day. Deliveries are long and it is almost impossible for jobbers to accumulate stocks amounting to anything. One jobber reported $25,000 in unfilled radio equipment orders on hand last week after barely a month's work as a distributer. On 3,000-ohm receivers one manufacturer recently quoted six months' delivery.

Appliances.—Flatirons are moving well, and washing machines are in somewhat better demand. Interest is apparent in a new combination grill and toaster which is coming into the market in small quantities. Vacuum cleaners are a little more active, and toasters and percolators are moving in response to vigorous sales efforts.

ATLANTA

The Sixth Federal Reserve Bank in its last report states that there has been "more apparent progress" in business during the past few weeks than for some time past, and the report as a whole can be summarized as distinctly optimistic. Electrical jobbers, however, say that their business is rather quiet, inclement weather continuing to hold up construction and purchases of wiring material. Just as soon as weather conditions will permit, however, construction should get under way and employment increase rapidly. In fact, employment in Chattanooga, New Orleans and Birmingham is on the increase, while Atlanta has shown but little variation since last month. Savannah is also reported as showing employment on the increase, though it appears that a decrease will be temporarily effected by the curtailment in the operation of textile plants throughout the section, this curtailment now being daily expected. The Sixth Federal Reserve Bank announces a reduction in the rediscount rate from 5 to 4½ per cent, which should stimulate expansion. Announcement has been made of an available appropriation of $400,000 for the additions and improvements to the infantry training camp at Fort Benning, Ga., and activity is noted among municipalities in the building of schools and other improvements.

Flexible Non-Metallic Conduit.—Building of small homes is stimulating the demand for this line, and the movement is the best reported in several weeks in both the ⅜-in. and ½-in. size. Local stocks of both sizes are in satisfactory shape, with shipments good. A price reduction of 10 per cent was announced last week.

Distributing Transformers.—Anticipated activities have not developed, owing in a great measure to inability to complete home and commercial building projects which have been held up by weather conditions. As soon as this work gets under way, this line should respond accordingly.

Armored Conductor.—Considerable activity is reported in armored conductor, the No. 14, two-wire, single-strip variety leading in popularity. Wiring of old houses is consuming its share. Stocks are in good shape with shipments satisfactory. A price reduction of 10 per cent became effective ten days ago.

Lightning Arresters.—This line, which should be moving excellently at this time, continues somewhat sluggish, there having been no thunderstorms of moment this spring. There should be a brisker demand upon the advent of hot weather and the lightning season. Jobbers have accumulated fairly good stocks in anticipation of a good movement.

Sewing Machines.—Except in isolated instances, sewing machines continue dormant, a jobber here and there being able to move his stock by vigorous sales campaigns.

Flashlamps and Batteries.—The sales of batteries and cases are reported as only fair, the volume being considerably reduced from that of the same period a year ago. Flashlamps also continue sluggish with little likelihood of a pick up for some months.

Wire.—The low base prices are causing a very satisfactory movement of both weatherproof and rubber-covered varieties in all of the popular sizes, while occasionally a large order for the heavier sizes is recorded. The base at the present time is 15 cents with stocks in good condition.

High-Tension Transformers.—A fair activity is to be noted, particularly in the sizes from 75 kva. to 200 kva. in 11,000, 19,000 and 38,000-volt types. A few of the smaller sizes are in stock with shipments on the larger sizes up to 1,000 kva. at about forty-five days.

ST. LOUIS

To what extent the coal strike is going to affect the electrical interests in this territory can only be conjectured. One jobber reports that sales to the mines have been somewhat heavier than usual the past few weeks, equipment being installed to care for the property while there is an enforced shortage of labor. However, from now until the strike is concluded there will probably be very little selling to the mining companies, and this will materially reduce the volume of St. Louis sales. As far as the shortage of coal is concerned the St. Louis utilities are considered to be in good position.

Business of the jobbers was universally better last week than has been customary, and all of the lines were apparently benefited by the improved demand. Central-station companies are better buyers of poles, cross-arms, transformers, meters and lightning arresters, the latter being especially in demand. Wiring supplies are selling in gradually increasing amounts as building progresses. Construction work is being materially advanced by the reductions being made in wage scales. Last week the hoisting engineers voluntarily voted a 10 per cent reduction. The carpenters have indicated willingness to accept a reduction of the same amount, but have refused to accept a 20 per cent reduction, and construction work may be hampered until a definite agreement is reached. Work to cost about $8,000,000 and to start soon has been announced.

Wire.—Substantial improvement in the sale of rubber-

covered and weatherproof wire is reported, but bare is still moving slowly. The usual price for No. 14 rubber-covered is $6.25 per 1,000 ft. in 5,000-ft. lots. The base price on weatherproof is 15.85 cents per pound, and that on bare is 15.5 cents per pound, both of these representing reductions of ½ cent per pound.

Poles.—While the total movement is still small compared with normal times. it is much heavier than has been experienced for several months. Buying is principally for distribution work of the central stations, as the transmission jobs have not yet materialized. Inquiries for the latter, however, are quite active. The following are representative quotations for Northern white-cedar poles with 7-in. tops, in car-load lots, f.o.b. St. Louis: 30-ft., $8.90; 35-ft., $14.60; 40-ft., $18.30; 45-ft., $21.75.

Lightning Arresters.—The compression type of arrester, for 2,300-volt and 4,000-volt lines, is selling exceptionally well in the central-station companies in preparation for coming thunderstorms. The aluminum and oxide-film arresters are moving very slowly because of the lack of the higher voltage transmission construction.

Pliers.—The demand for the past year has been very quiet. The contemplated extension work may afford some stimulus, but no material increase in sales is expected before next fall. Prices have not changed for several months, and the Klein side-cutting plier is now priced at $2.80 for the 6-in. size and at $3.75 for the 8-in. size.

Rigid Conduit.—The ½-in. black experienced much better demand last week and is expected to sell in satisfactory amounts for the rest of the year. Stocks of about thirty days are being carried in all kinds. Prices per 100 ft. in 100-ft. lots are: ½-in. black, $4.35; ½-in. galvanized, $4.95; ¾-in. black, $5.50; ¾-in. galvanized, $6.30.

SAN FRANCISCO

Warmer weather throughout the state and just enough rain promise excellent crop conditions. Many conventions are scheduled for this year, and municipal appeals to renovate and renew in preparation for the expected crowds of visitors are reflected in the many small jobs given to contractors.

The San Francisco Chamber of Commerce is beginning to organize a series of sales trips for executive members of firms affiliated with it. These trips are made to territories which have not been thoroughly solicited or which lie in the debatable "No Man's Land" between cities. The convenience outlet and range campaigns are also stimulating California business.

Lamps.—The reduction in price, effective April 1, has produced no appreciable increase in sales. Lamp business, in fact, has maintained an excellent level all through the spring months. Intensive canvassing of agents and scientific display of publicity matter are features of this business.

Radio Apparatus.—The future of this business cannot be predicted, but that it will reach large dimensions seems assured. There are constant shortages of indispensable material such as head sets. Each daily paper is now maintaining a radio section, and department stores are devoting a large amount of advertising to it. It is evident that the country dealers have been rather slow in installing radio departments, for a large proportion of local shipments are made to interior addresses.

Tape.—Commercial grades of tape in 8-oz. rolls and in 200-roll lots are now being quoted pretty generally at about 40 cents per pound for the friction, and 36 cents per pound for the rubber with a 5 per cent higher price in fifty-roll lots. Local stocks are good.

Appliances.—Except in the case of a few companies who are waging vigorous door-to-door campaigns, household-device business is in an uncertain state, most dealers agreeing that it needs new methods of handling. Few, however, can suggest any practical solution, and as a matter of fact the buying public is more unreceptive even than last year. Soliciting salesmen have concentrated upon the lower-priced articles, such as vacuum cleaners. Los Angeles dealers in general are doing better in these lines than those around the bay cities.

SALT LAKE CITY—DENVER

With the exception of the Utah coal fields, production has been brought practically to a standstill in the intermountain region. The Utah mines operate on a non-union basis, and only a negligible number of miners have laid down their tools in sympathy with the strikers. The effect will be a widened market for the Utah product and possibly an increased production. In territories affected by the tie-up there is no serious concern about the outcome.

The most significant event in months was the unheralded resumption of copper production in Utah and Nevada. Thousands of men who have been idle for many months have been called back into service. It is the general belief, substantiated by reliable forecasts, that there will be a gradual increase in production until normal capacity has been reached. This has had a decidedly good effect on business. It is declared to be the beginning of the end of hard times in the mountain country. Building and construction look extremely promising. In some of the larger Colorado cities records have been broken for the number of building permits issued for a given period of time.

Gradual improvement in the money market is noted. The live stock industry and agriculture are being well taken care of by financing corporations, including the War Finance Corporation. There is a tendency to recession in money rates. Collections are somewhat better.

Appliances.—Very little electrical merchandise is moving, except such appliances as vacuum sweepers, flatirons and washers. Jobbers are generally prepared to handle orders without recourse to factory consignments. Prices are tending downward.

Mining Equipment.—The purchasing departments of copper companies are showing signs of interest in the market. Such electrical equipment as they use will be in decidedly better demand.

PORTLAND—SEATTLE

The general trend of business seems to be one of slow but gradual improvement. The curve dips now and then but again recovers and proceeds upward. February and the first part of March indicated a slump from which business recovered later. One knitting mill in Portland reports greater business booked so far this year than for the entire year 1921. Portland's building permits for the month of March were the greatest in the history of the city. Bank clearings and shipping both showed healthy increases. Residence construction throughout the Northwest continues active, creating a good demand for wiring supplies. Lumber production for the week ended March 25 was only 10 per cent below production, while new business was 16 per cent above production and shipments were 13 per cent below new business. At this rate it is very evident that it will soon be necessary for lumber operations to increase.

Electrical jobbers report business about the same or in some cases a trifle improved. There is a very active demand for schedule material and also for No. 14 wire. In the case of the wire the activity may perhaps be due to a feeling that wire has about reached the bottom of the market. Dealers and contractors of Portland report business to be about the same. Contracting business is active in small lines but still uncertain on larger contracts. Fixture business is very active owing to the increase in residence building, while store business is slow.

Rigid Conduit.—The ½-in. galvanized conduit is quoted at from $6.12 to $6.80; ½-in. black from $5.62 to $6.25; ¾-in. galvanized from $7.97 to $8.85, and ¾-in. black from $7.24 to $8.05 per 100 ft. in less than car-load lots. Demand is steady, prices are firm and stocks are ample.

Flexible Armored Conductor.—No. 14 single-strip armored conductor is quoted at from $54.33 to $59.25 per 1,000 ft. in coil lots of 250 ft. No. 14 double-strip in similar lots is quoted at from $56.33 to $61.70 per 1,000 ft. Demand is moderate.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Hurley Company Plans Pacific Coast Factory

A $1,250,000 factory branch of the Hurley Machine Company, Chicago, is being planned for construction on the Pacific Coast, according to E. N. Hurley, president of the company, who is visiting the Coast to inspect various available sites. As planned, the proposed plant would cover 100,000 sq. ft. and employ about 400 workers. The company manufactures electric washing machines, irons and other appliances.

Hartford Electrical Supply Company Expands

The Hartford (Conn.) Electrical Supply Company has purchased a three-story building at 234 Pearl Street, Hartford, giving about four times the floor area occupied by this house at its former quarters on Haynes Street and has transferred its entire activities to the new address. The company has added a fixture department, representing L. Plaut & Company, New York, and is now taking agencies for various specialties in radio-telephonic apparatus. Dwight Pease, at present Pittsburg representative of the Hart & Hegeman Manufacturing Company, Hartford, will join the Hartford Electrical Supply Company May 1 as vice-president. He will take immediate charge of business in the city of Hartford.

States Company Enjoys Brisk Meter Demand

Brisk business in meter-testing apparatus is reported by the States Company, Hartford, Conn., the first two weeks in March representing the best fortnight's sales in the company's history. C. F. Upson, sales manager, informed a representative of the ELECTRICAL WORLD last week that the company is quoting deliveries of from four to six weeks on phantom-load sets, and that there is an increasing demand for test tables from many parts of the United States. A recent order for ten phantom-load sets was received from Australia and another from Hawaii for a good quantity. The company has entered the field of manufacture of amplifying and continuous-wave transformers for radio service. Business in general is at least 50 per cent better with this concern than during 1921, and the demand for test tables is better than at any time since 1917. The company has recently appointed the following new distributers: Intermountain Sales Company, Denver, Col.; Industrial Power Equipment Company, Kansas City, Mo., and the George C. Rough Sales Corporation, Montreal, Que.

Robbins & Myers Company Enlarges Sales Staff

A number of additions have been made to the sales staff of the Robbins & Myers Company, fan and motor manufacturer, Springfield, Ohio, according to a statement to the ELECTRICAL WORLD. N. R. Norman, formerly of the New York office of the Western Electric Company, has joined the New York branch of the Robbins & Myers Company, while J. E. Timmons, formerly with Frank Toomey, Inc., Philadelphia, has joined the Philadelphia branch. A. I. Benedict has become connected with the Chicago branch, while E. A. Barbeau is now with the general sales office in Springfield. Mr. Benedict was formerly with the Miller-Seldon Electric Company, Detroit, and Mr. Barbeau was with the General Electric Company and Domestic Electric Company. J. J. Martin, formerly of the Philadelphia branch, has been made manager of the Buffalo office.

Woodward Governors on 200,000-Hp. Waterwheels in 1921

During 1921, according to a statement made by R. J. Kelley, general manager Woodward Governor Company, Rockford, Ill., the company furnished governors for waterwheels totaling a rating of about 200,000 hp. These waterwheels ranged in capacity from about 1,500 hp. to 20 hp. under heads from 500 ft. to 6 ft. About 150,000 hp. were vertical-shaft units and 50,000 hp. were horizontal-shaft installations. The distribution of the installations was approximately as follows: 60,000 hp. in the Eastern States, 25,000 hp. in the Central States, 35,000 hp. in the Western States, 10,000 hp. in the Southern States and 70,000 hp. in Canada, Europe and Japan.

Organizes to Manufacture Radio Apparatus

Forbes-Babcock, Inc., 4,113 West Irving Park Boulevard, Chicago, has recently been incorporated to manufacture radio-telephone receiving sets. Plans are being made at the present to obtain factory space, and equipment will be installed as soon as this is accomplished. Allen C. Forbes is president of the company, Samuel Rubinkan is vice-president and Robert S. Babcock is secretary-treasurer.

Manufacturer of U. S. Motors Reports Increasing Business

The U. S. Electrical Manufacturing Company, Los Angeles, motor manufacturer, reports that its business for 1922 to date shows a satisfactory increase over the corresponding period of last year. Business booked for the month of February shows orders equal to 200 per cent of those for February, 1921, making the month of February, 1922, the largest month's business in the history of the company. This company began the production of motors on the Pacific Coast thirteen years ago and has specialized in this line of manufacture during the entire time.

In order to take care of the rapidly increasing growth of its business, the company is planning the construction of a new factory and expects to occupy it the latter part of the present year. The new plant will take care of the largely increased demand and be of the most modern construction. H. G. Steel, president, and C. E. Johnson, vice-president, intend to spend thirty days on an Eastern trip, studying the various types of factory construction. They expect to leave for the East during the month of May.

First Quarter Reported Good by Black & Decker

The Black & Decker Manufacturing Company, Baltimore, has just declared a dividend for the first quarter of this year at the rate of 8 per cent on the preferred stock. The sales of the company have been increasing by leaps and bounds this year, and the actual sales recorded for the last week in March were the highest for more than two years. Sales two weeks before that were more than any week for twenty-two months. The company set its sales quota for this year a half million dollars higher than its actual sales last year and for the first quarter of this year officials report that this quota has been reached.

International Western Electric Reports Good Year

Despite the world-wide business depression during 1921, the International Western Electric Company, Inc., reports that year as the best in its history. The total sales of the company and of its foreign associated companies amounted to $41,000,000 at the current rates of exchange, or about $49,000,000 if figured with exchange at par. The profits also were larger than in any previous year of the company's history.

The business of the company is divided into two general classes—apparatus manufactured and sold abroad by its foreign associated companies in which the company owns a controlling or part interest and apparatus exported from this country. For the first time since the war the plants of the associated companies in England and Belgium were operated at full capacity. The export business from this country

compared quite favorably with that of 1920. This was due, however, to a very considerable extent, to orders which were on hand at the first of last year. The input of orders last year was smaller than in 1920, and the company's executives express themselves as seeing little prospect of improvement during the current year, although the rise in exchange rates will help the situation somewhat. Prospects for the foreign associated companies for the current year, however, are good. The demand for telephone equipment all over the world continues to increase, and while competition is always keen, the manufacturing facilities of these foreign associated companies and the technical assistance furnished them by the Western Electric Company has enabled them to improve their position year by year.

General Electric Allowed to Issue Non-Voting Stock

The New York State Legislature before adjournment passed the Walton bill (Senate Print No. 1,100) amending the act incorporating the General Electric Company by providing that the said corporation, notwithstanding any other provision of law, may issue one or more classes of preferred stock, having a par value of not less than $10 and not more than $100 per share. This stock will not entitle the holder to vote at any meeting of stockholders or election of the company or to participate otherwise in any action taken by the corporation or stockholders except as expressly authorized at its issue by the incorporation. If so authorized, the vote is to be on the basis of one vote for each $100 of par value of the stock. The provision in the charter that each share of stock, whether preferred or common, shall entitle the holder thereof to one vote has been changed to read "each share of common stock shall entitle the holder thereof to one vote." The bill is in the hands of the Governor as a thirty-day bill.

Anchor Lite Company to Expand Activities

It is the announced intention of the Anchor Lite Appliance Company, 420 Wood Street, Cleveland, manufacturer and distributer of electric lighting fixtures and supplies, to enlarge the activities of the jobbing end of the business. A radio department has been added and several lines of equipment are being carried. The electrical supply department is to be in charge of H. W. Goldstein. A. S. Goldstein will have charge of the department handling lighting fixtures, glassware, portable lamps and household electrical specialties.

A. S. Goldstein, president of the company, has purchased the stock held by S. J. Goldberg and M. Kimball and now controls the entire stock originally issued.

Street-Lighting Activity Reported at Conference

A conference of lighting specialists was held recently at the plant of the George Cutter Company, South Bend, Ind., under the direction of L. A. S. Wood, general manager of the illuminating section. The George Cutter Company, now owned by the Westinghouse Electric & Manufacturing Company, specializes in street-lighting fixtures and equipment of all kinds, and the conference was for the purpose of training salesmen for this particular kind of work. Mr. Wood, who has been closely identified with the lighting industry in this country and abroad, states that there never has been a period in which so much interest has been shown by the public in improved lighting, and that street lighting is probably the most active branch of the electrical industry at the present time.

In order to promote the publicity campaign, which is coupled with popular advertising in leading journals, the Westinghouse company has trained a staff of lighting specialists who will be permanently stationed at each of the offices of the company to make reports on improvements in street lighting and to assist in the promotion of ornamental lighting systems.

The conference covered a period of three days. Prominent speakers who delivered addresses were W. T. Blackwell, L. A. S. Wood, Gates Harpel, H. H. Ashinger, Earl Pillsbury and J. H. Waxman. J. H. Lynch of Boston was the principal speaker on the second day. The subject of his address was "How I Am Going to Create a Demand for Our Ornamental Street-Lighting Systems." Other speakers on the program were C. J. Stahl, who was heard on "Selling the Salesman;" Warren Ripple, vice-president of the company, and L. A. S. Wood. The principal address at the closing session was delivered by P. Y. Danley, St. Louis, on the subject of "My Experience as a Lighting Specialist." F. A. Clarke gave some instruction and advice on "The Order and Follow-Up System." J. R. Townsend was heard on "Projectors and Our Development Program," and the meeting was closed with a general discussion on arc lamps led by L. A. S. Wood.

Credits Helped by Jobber Salesmen

At a meeting of salesmen employed by Seattle jobbers held recently under the auspices of the Northwest Electrical Service League the salesmen heard how they and local organizations could help to improve conditions among their retail customers and cut down credit losses. The talk in question was delivered by M. R. Chatfield of the Electrical League of Vancouver, B. C. The Vancouver organization and the jobber salesmen members, said Mr. Chatfield, have been preaching low stocks and a quick turnover, and it has been found that dealers are not only discounting their bills and establishing better credit but are actually able to do more business.

Prof. W. D. Moriarity of the University of Washington talked to the salesmen on window trimming, while Mr. Davis of the National Association of Electrical Contractors and Dealers talked on store display.

The National Radio Electric Corporation, Wilmington, Del., has filed notice of increase in capital stock from $300,000 to $1,200,000.

The Champion Electric Manufacturing Company has filed notice of change in name to the Champion Appliance Manufacturing Company, Inc., New York.

The Federal Sign System (Electric), 651 West Forty-third Street, New York City, has filed notice of change in name to the Federal Electric Company.

The Uehling Instrument Company, manufacturer of CO_2 recorders and other fuel-economy equipment, has moved its main office from 71 Broadway, New York, to its factory at 473 Getty Avenue, Paterson, N. J.

The H. Lee Reynolds Company, Pittsburgh, manufacturers' representative for industrial electrical equipment, announces the removal of its offices from the First National Bank Building to the Henry W. Oliver Building, where it has much larger quarters.

The McKenney & Waterbury Company, Inc., Boston, has been appointed New England distributer for the Sunny Suds Appliance Company, Detroit, manufacturer of washing machines. The company will distribute the radio apparatus manufactured by the Connecticut Telephone & Electric Company, Meriden, Conn. Kendall Redfield has been appointed manager of the radio department of the McKenney & Waterbury organization.

The Wetmore-Savage Company, Boston, has opened a branch of its main electrical supply jobbing establishment at 46 Hampden Street, Springfield, Mass., to expedite the handling of its Connecticut Valley and western New England business. A full line of electrical supplies and automobile accessories will be carried. J. Edward Hall, formerly western Massachusetts representative, has been appointed manager, and Byron H. Spinney, formerly Connecticut representative, has been made sales manager of the Springfield branch.

The Weston Electrical Instrument Company, Newark, N. J., has appointed the Shiefer Electric Company, Inc., with offices at Rochester, N. Y., as sales representative for upper New York State and Erie, Pa. L. D. Joralemon, Otis Building, Philadelphia, has been appointed representative for Pennsylvania, Delaware, Maryland and the District of Columbia, and the Warren C. Graham Company, Carondolet Building, New Orleans, will represent the Weston company in Louisville, Mississippi and lower Alabama.

Foreign Trade Notes

DEMAND FOR SMALL LIGHTING PLANTS IN SOUTHERN ARABIA.—Farm-lighting plants, according to *Commerce Reports*, can be sold in southern Arabia to a limited extent. Aden, with a population of 50,000, including many Europeans and wealthy Parsee, Indian and Arabian merchants, has no central-station service. The heat makes electric fans most desirable, and the possibility of using individual lighting plants to operate them is a good selling factor.

INCREASING DEMAND FOR ELECTRICAL MACHINERY IN BRITISH MALAYA.—According to the *Electrician*, there is an increasing demand for electrical machinery in the British portion of the Malay Peninsula. During 1920 imports were valued at £241,923, against £60,525 in 1917, and exports increased to £51,002, against £18,795 in 1917. Though classified as exports, the electrical goods sent out of the Straits Settlements do not to any great extent leave the Peninsula, but find their way to the federated and unfederated Malay States, in 1917 to the value of £14,823; in 1918, £10,317; in 1919, £22,818, and in 1920, £32,497. Of the machinery imported in 1920, the United Kingdom supplied £123,122, against £50,430 in 1919; the United States £46,985 in 1920 and £74,593 in 1919. In the Federated Malay States the supervision of electrical machinery is intrusted to the Senior Warden of Mines, and according to A. R. Mynott's report, the number and capacity of installations of generating plants in 1918, 1919 and 1920 were as follows: 106 plants, total capacity 9,360 kw.; 109, 9,544 kw., and 110, 10,376 kw., respectively. In addition to these there were forty-five self-contained low-voltage lighting plants in private houses and plants of about 900 kw. in course of construction at the close of the year.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

A commercial agency firm in Spain (No. 1,220) wishes to purchase electric motors and electrical material and also to secure an agency for their sale.

A firm in Italy (No. 1,267) desires an agency for the sale of electric insulating material.

ESTABLISHING AGENCIES IN EUROPE.—The president of an American manufacturing company is planning to go to Europe in July for the purpose of establishing agency connections in various European markets. He wishes to represent three other electrical manufacturers who desire to make similar connections in Europe. Particulars may be obtained from the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Washington, D. C.

AGENCY WANTED FOR HEATING AND COOKING APPARATUS.—Manufacturers interested in obtaining a representative in New Zealand to handle electrical heating and cooking apparatus can be put in touch with a well-established firm at Wellington which desires to obtain an agency for this line of goods. Particulars may be obtained from the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, Washington, D. C.

New Apparatus and Publications

PULL SOCKETS. — Bulletin No. 17-10 issued by Harvey Hubbell, Inc., Bridgeport, Conn., describes the "Hubbell" pull sockets for candle fixtures.

TRADE DIRECTORY. — An electrical trades directory and handbook for the British Isles for 1922 has been brought out by Benn Brothers, Ltd., 8 Bouverie Street, London, E. C. 4, under the name of "The Blue Book."

USED EQUIPMENT.—A catalog of used equipment for power, ice, refrigerating, chemical and pulp and paper plants has been issued by the Technical Products Company, Inc., 300 Madison Avenue, New York.

SWITCHBOX TEMPLATE.—The Sea-Lu Company, 10 Highgate Street, Lawrence, Mass., has recently placed on the market the "Sea-Lu" switch-box template.

STREET LIGHTING.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing a four-leaf circular on street lighting in which it calls attention to the organization of the illuminating engineering bureau of the Westinghouse company for the purpose of handling street-lighting problems.

RADIO GROUND SWITCHES.—Bulletin No. 26 issued by the Barkelew Electric Manufacturing Company, Middletown, Ohio, describes the "Barkelew" radio ground switches.

AMPLIFYING TRANSFORMER. — The Coto-Coil Company, 87 Willard Avenue, Providence, R. I., is distributing bulletin 4, covering its type 5,000 radio-frequency amplifying transformer.

CLOCK.—The Sterling Clock Company, 220 East Forty-second Street, New York City, has placed an electric mantel clock on the market.

SAFETY SWITCH. — A new safety switch for electric ranges has been placed on the market by the Electrical Manufacturing Company, 4,149 East Seventy-ninth Street, Cleveland.

HOT PLATE.—A new hot plate designed to fit any gas stove and which can be used as an electric toaster, heater or warmer for hospitals, chemical laboratories, etc., has been developed by the Acme Electric & Manufacturing Company, 1444 Hamilton Avenue, Cleveland.

THERMOSTATS.—A line of electrically operated thermostats for heat regulation in residences, offices and public buildings is manufactured by the Gold Car Heating & Lighting Company, 220 Thirty-sixth Street, Brooklyn, N. Y.

CLOTHES WASHER.—An oscillating clothes washer, known as the "One Minute" cabinet washer, has been put out by the One Minute Manufacturing Company, Newton, Iowa.

IRON.—The Electro Weld Company, 70 Munroe Street, Lynn, Mass., has placed on the market the "Reverso" electric iron with an automatic current shut-off.

WATER HEATER.—The S. U. E. Company, 89 Beach Street, Boston, has placed on the market a new electric water heater for use on faucets.

LUMINOUS PENDANT. — The Eagle Manufacturing Company, 430 Kent Avenue, Brooklyn, N. Y., has placed on the market the "Radium-Lite" luminous pendant.

HOIST.—A small, self-contained portable hoist electrically driven is being marketed by the Treadwell Engineering Company, Easton, Pa.

CONSTRUCTION SUPPLIES. — The Fletcher Manufacturing Company, Dayton, Ohio, is distributing catalog No. 568, listing its electrical construction supplies for central stations.

OVERLOAD RELAY.—Brown & Pengilly, 607 East Fourth Street, Los Angeles, have brought out a new type of overload relay for particular application to induction motors. These relays are made for voltages up to 2,500 volts and currents from 5 amp. to 600 amp.

LOAD-TESTING SET.—Brown & Pengilly, 607 East Fourth Street, Los Angeles, are manufacturing an improved type of load-testing set, consisting of an ammeter and a split-core current transformer, for use on alternating-current circuits.

New Companies

THE WHEATLEP FALLS POWER COMPANY, Remington, Va., has been incorporated with a capital stock of $100,000 to distribute electricity in Culpeper and Fauquier Counties. A. L. Hord is president and S. W. Cole is secretary.

THE UNIVERSAL ELECTRIC COMPANY, 243 Washington Street, Jersey City, N. J., has been incorporated by Edward A. Markham, 626 Bergen Avenue, Jersey City; Frank H. Gates, 4 Wakeman Avenue, Newark, and Henry E. Forcsutt, Edgewater Avenue, Ridgfield. The company is capitalized at $100,000 and proposes to manufacture and deal in electrical fixtures.

THE SIGNAL ENGINEERING & MANUFACTURING COMPANY, Worcester, Mass., has been incorporated with a capital stock of $100,000 to manufacture electrical and mechanical apparatus. The incorporators are John F. Moran, Jersey City N. J.; John E. Wjeelock, Fitzwilliam, N. H., and Albert E. Fay, Worcester, Mass.

THE FEDERAL RADIO LABORATORIES, INC., Elmira, N. Y., have recently been incorporated for the manufacture of small radio parts. The directors are C. E. Johnson, 403 West First Street; H. S. Thayer, 150 Lake Street, and J. K. Whitaker, 370 Fulton Street, Elmira, N. Y.

Record of Electrical Patents

Notes on United States Patents

(Issued March 14, 1922)

1,409,898. AUTOMOBILE SIGNAL; Emil E. Olson, Denver, Col. App. filed May 20, 1921. Rear light for right, left or stop signal.

1,409,895. ELECTRIC STORAGE BATTERY; William Knoblock, Philadelphia, Pa. App. filed May 2, 1918. Grids made in tubular form.

(Issued March 21, 1922)

15,313 (reissue). ARC-WELDING SYSTEM AND METHOD OF OPERATING THE SAME; Harry D. Morton, Detroit, Mich. App. filed Dec. 2, 1918. Automatic feed.

1,409,913. MESSAGE-REGISTER SYSTEM; Frederick Avery, New York, N. Y. App. filed June 4, 1920. To register calls on party line telephones.

1,409,927. BUSBAR SUPPORT; Christen Christensen, Chicago, Ill. App. filed March 20, 1920. Busbars held by supports on two sides.

1,409,948. COMBINED RESISTANCE ELEMENT AND REGULATOR; William A. Harvey, Scranton, Pa. App. filed March 1, 1921. Placed in shower lighting fixture to regulate brilliancy of lamps.

1,410,003. REPEATER APPARATUS; Charles S. Demarest, Brooklyn, N. Y. App. filed Oct. 2, 1919. For both automatic and manually operated telephone panels.

1,410,035. SUPPORT FOR INSULATING BASES; Joseph C. Regan, New Britain, Conn. App. filed March 19, 1919. Holds switch base away from panel.

1,410,053. ELECTRICALLY HEATED BURNISHING MACHINE; Frank E. Boothroyd, Beverly, Mass. App. filed May 2, 1921. Burnishes the sole edges of boots and shoes.

1,410,062. RECTIFIER FOR ALTERNATING CURRENTS; Gilles Holst and Ekko Costerhuis, Eindhoven, Netherlands. App. filed May 10, 1920. Electrodes of tubes can be used as cathodes or anodes.

1,410,065. INCUBATOR; Simeon A. Keller, Knoxville, Tenn. App. filed March 12, 1921. Two automatic electric elements for heating.

1,410,176. ELECTRIC IGNITER FOR CIGARS; Manious Garl, Akron, Ohio. App. filed Nov. 16, 1920. On dashboard of automobiles.

1,410,215. ELECTROMAGNETIC TRANSMISSION; Alfons H. Neuland, Bergenfield, N. J. App. field May 27, 1918. Electromagnetic power transmission for automobiles.

1,410,251. MAGNETO PLUG; Howard J. Hoegg, Weatherly, Pa. App. filed Nov. 3, 1921. For Ford automobiles.

1,410,262. SWITCH FOR ELECTRIC FLATIRONS; Charles W. Mabey, Indianapolis, Ind. App. filed March 24, 1919. Circuit completed when operator grasps handle.

1,410,276. MOTOR VEHICLE; Leigh J. Stephenson, Chicago, Ill. App. filed June 10, 1918. Rear wheels driven by engine, front wheels by two motors supplied by storage battery and generator.

1,410,292. INDICATOR FOR GARAGES, ETC.; John A. Granstrom, Boston, Mass. App. filed April 27, 1921. Registers number of machines passing in and out.

1,410,304. ELECTRIC INDUCTION FURNACE; Albert Hiorth, Asker, Norway. App. filed Feb. 9, 1921. Performs smelting under vacuum or under any desired pressure.

1,410,335. ELECTRIC FLASHLIGHT; Engelbert Ludescher, Chicago, Ill. App. filed April 12, 1920. Switch placed between bulb and battery.

1,410,392. SIGNAL; Albert L. Eliel, Los Angeles, Cal. App. filed Jan. 15, 1919. Indicates direction automobile is turning.

1,410,395. ELECTROMAGNETIC BRAKE; Bernhard E. Fernow, Jr., Milwaukee, Wis. App. filed Dec. 16, 1918. Electromagnet placed next to one shoe.

1,410,400. ELECTRIC HEATER; Nicola Furfaro, Seattle, Wash. App. filed April 6, 1921. Removable secondary reflector to reflect heat sideways.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BANGOR, ME.—Corson Brothers & Company contemplate the construction of a hydro-electric power plant at Six Mile Falls, near Bangor. A site has been acquired and plans are being prepared.

PERHAM, ME. — Application has been made to the Public Utilities Commission by Charles O. Austin for permission to generate and distribute electricity in Perham.

HARDWICK, VT.—The Council is considering the installation of a new street-lighting system.

BOSTON, MASS.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until April 26, for the construction and equipment of an electric substation and distributing system at the naval drydock, South Boston. (Specification 4550.)

EAST BRAINTREE, MASS.—Extensions are contemplated to the municipal electric light plant, including the installation of an additional 600-hp. boiler and 2,000-kw. turbine. F. B. Lawrence is manager.

NEW BEDFORD, MASS.—The New Bedford Gas & Edison Light Company has awarded a contract to Stone & Webster, Inc., 147 Milk Street, Boston, for extensions and improvements to its plant at the foot of Cannon Street, to cost about $1,750,000. The work will include an addition to power station, 60 ft. x 150 ft., and the installation of a 20,000-kw. turbine and two 1,600-hp. boilers.

NEW BEDFORD, MASS. — The Union Street Railway Company has started work on the installation of new equipment in its power house on the water front, consisting of a 2,500-kw. turbo-generator unit, a 2,500-kw. converter and a condenser. The Harry M. Hope Company, Boston, is engineer.

NORTHAMPTON, MASS.—An appropriation of $14,000 has been made for the installation of a new fire-alarm system.

WAKEFIELD, MASS. — At an election held recently the proposal to sell the municipal electric light plant to the Malden & Melrose Gas & Electric Company was defeated.

PUTNAM, CONN.—The Eastern Connecticut Power Company, Norwich, Conn., has acquired the property of the Putnam Light & Power Company and will connect the system with its lines. Extensions and improvements will be made to the power plant at Mechanicsville, and in the transmission and distributing systems.

VERSAILLES, CONN.—The Inland Paper Board Company will build a one-story power house at its plant, 50 ft. x 62 ft.

Middle Atlantic States

ALBANY, N. Y. — The Municipal Gas Company is taking bids for the erection of a one-story addition to its Riverside electric power plant, 50 ft. x 170 ft. Thomas E. Murray, 50 Duane Street, New York, is engineer.

BUFFALO, N. Y.—The Buffalo General Electric Company contemplates extensive improvements to its system this year, involving an expenditure of about $2,000,000. Roscoe McMillan is statistician.

CLIFTON SPRINGS, N. Y.—At an election held recently the proposal to sell the municipal electric light plant to the Empire Gas & Electric Company, Geneva, was carried.

NEW YORK, N. Y.—The Department of Plant and Structures, Municipal Building, will call for bids at once for the construction of two, and possibly three, electrically operated ferry boats for Staten Island service, to be equipped with generators, etc. Grover A. Whalen is commissioner.

NEW YORK, N. Y.—The Alaska Development & Mineral Company, a subsidiary of the Kennecott Copper Company, 120 Broadway, contemplates the construction of a hydro-electric power plant on the Tyee and Anan Creeks, Alaska. Permission was granted by Federal Power Commission.

TROY, N. Y. — The Eastern Malleable Iron Company has awarded a contract to the Fred T. Ley Company, Springfield, Mass., for the erection of a one-story power plant, 50 ft. x 190 ft.

WOODVILLE, N. Y.—Steps have been taken to organize the Woodville Light & Power Company to distribute electricity in Woodville and vicinity. Energy will be purchased from the Northern New York Utilities, Inc., Watertown. The company will require material and equipment for high-tension and distribution lines, switchboard and meters. The total cost, including 4 miles of transmission line, will exceed $10,000. The incorporators will be D. H. Liard, Edward Eastman, G. E. Converse.

DOVER, N. J.—An ornamental lighting system will be installed on Blackwell Street, comprising about seventy-four lamps, each of 250 cp., replacing the arc-light system now in use. The Business Men's Association is interested in the project.

NEWARK, N. J.—A power house will be erected by the National Oil & Supply Company at its plant at Frelinghuysen Avenue and Bigelow Street, to cost about $17,000.

NEWARK, N. J. — The Public Service Electric Company has plans under way for extensions and improvements to its system, to cost about $10,000,000, during the next three years. Of this amount about $5,000,000 will be used during the present year, to include the installation of new equipment at the Essex power station, at the Burlington power plant and at plants at Trenton and Camden. Line extension work will cost in excess of $1,000,000. An addition will be built to the testing laboratory at the Marion power plant and apparatus installed for testing pulverized fuel.

HANOVER, N. J. — The Hanover and Montville Township Committees are negotiating with the Morris & Somerset Electric Company, Morristown, for the installation and operation of a street-lighting system on the Pinebrook-Parsippany Road.

WILDWOOD, N. J.—The Wildwood Electric & Traction Company has made a proposition to the Council for the sale of its local electric power plant and traction system for $650,000. If taken over by the city, the plant will be extended and improved.

CHESTER, PA.—The board of directors of St. James Mercy Hospital plans to erect a power house at the institution in connection with the construction of a new main building.

DOYLESTOWN, PA.—The Bucks County Electric Company contemplates the erection of a new power plant in the vicinity of Doylestown, to be tied in with its present station at Yardley. The transmission system will be extended to New Hope, Stockton and surrounding district. Negotiations are under way for a new lighting contract, with improved system, at Doylestown.

LEBANON, PA.—The A. S. Kreider Shoe Company, Eighth and Water Streets, will build a power house in connection with its new factory at Fifth and Canal Streets, to cost about $100,000. Plans are being prepared by John H. Wickersham, Breneman Building, Tamaqua, Pa.

MOSCOW, PA. — The Moscow Electric Company, recently organized, has contracted with the Scranton (Pa.) Electric Company for electricity. A local distributing system will be installed.

PENBROOK, PA. — The Council has authorized the installation of a street-lighting system in Progress and Hainton Streets.

PHILADELPHIA, PA.—The Philadelphia Electric Company has increased its capital from $41,000,000 to $45,000,000, part of the proceeds to be used for extensions to its system.

PHILADELPHIA, PA.—A power house will be erected by the Cambria Silk Hosiery Company, Cambria and A Streets, at its new mill on Louden Street, to cost about $75,000. Louis Weber is president.

PHILADELPHIA, PA.—A power house will be erected by the Hensel-Colladay Company, Twelfth and Wood Streets, at its plant at Hunting Park Avenue and Twenty-first Street, to cost about $75,000. William H. Hensel is president.

PITTSBURGH, PA.—The Clarion River Power Company has issued $20,000,000 in capital stock, a large portion of the proceeds to be used in connection with a power development and hydro-electric generating plant on the Clarion River.

TREICHLER, PA. — The Pennsylvania Power & Light Company Allentown, will extend its transmission line here and install a local distributing system.

ST. MICHAELS, MD.—The St. Michaels Utilities Commission is moving its substation from the city limits into the center of the town, making it necessary to erect 4,000 ft. of 6,600-volt, three-phase transmission line. E. W. Milliken is manager.

ELKINS, W. VA.—The West Virginia & Maryland Power Company, a subsidiary of the West Penn Railways Company, has acquired the property of the Elkins Power Company. Extensions and improvements will be made to the local plant.

KINGWOOD, W. VA.—The West Penn Power Company has acquired the local municipal electric plant. Extensions and improvements will be made to the system.

PIEDMONT, W. VA. — The Board of Works will build a new electrically operated pumping plant at municipal waterworks.

FAIRFAX, VA.—The Fairfax & Loudon Light & Power Company, recently organized with a capital of $100,000, is having plans prepared for the construction of a transmission line, local substation and distributing system, to cost about $70,000. A. S. Harrison is vice-president.

FRANKLIN, VA.—The Municipal Light and Water Department contemplates the installation of a 300-hp. Keeler water-tube boiler and the erection of local distribution lines. W. A. Faulkner is superintendent.

HARRISONBURG, VA.—The Council has authorized plans for the construction of a new auxiliary steam-driven electric power plant, to supplement the hydro-electric generating station, to cost about $60,000.

LYNCHBURG, VA. — The Lynchburg Traction & Light Company has plans under way for the construction of a one-story addition to its steam-driven electric plant on Blackwater Creek. J. W. Hancock is general manager.

WARRENTON, VA. — The Warrenton Electric Light & Power Company expects to erect transmission lines to serve territory 12 miles distant and to install electrical service in two towns. James O'Connell is president.

North Central States

DETROIT MICH.—The Detroit Edison Company is preparing plans for an addition to its generating plant in the Ann Arbor district. Gardner S. Williams, Ann Arbor, is engineer.

FLUSHING, MICH.—The Hart Milling & Power Company contemplates alterations in its power house and the installation of additional switchboard equipment, and possibly new steam equipment and also new hydro-electric equipment. The company is also planning to extend its service to nearby towns and to erect electric lines to rural districts. C. O. Hart is engineer.

NADEAU, MICH. — Nadeau Brothers, owner of the local electric light plant, contemplate the purchase of electricity from a transmission line to be erected this summer. If the project goes through, the plant in Nadeau will be closed down.

DOVER, OHIO.—Bids will be opened on April 14 for the installation of an ornamental street-lighting system consisting of eighty lamps. The rebuilding of about 11 miles of lines of the municipal electric lighting system is under consideration. Homer Keppler is superintendent of the municipal electric plant.

KENMORE, OHIO.—A power house will be erected by the Palmer Match Company, Second National Bank Building, Akron, in connection with its new local plant, to cost about $250,000. Charles H. Palmer is president.

MANSFIELD, OHIO — The Western Power Company will build a new transmission line in Crawford County in the vicinity of Bucyrus. The R. M. Mead Company, Shelby, Ohio, is engineer.

NORTHFIELD, OHIO. — The Board of Public Affairs contemplates the erection of 1 mile of primary service lines to serve from twenty to thirty consumers. O. Patterson is clerk of board.

PRAIRIE DEPOT, OHIO.—D. M. Scott, owner of the local electric lignt plant, contemplates erecting an electric transmission line, 5 miles long, to a neighboring town, and will also furnish electricity for lighting rural districts.

TIPPECANOE, OHIO. — Bonds to the amount of $60,000 have been authorized for enlarging the municipal electric light plant and waterworks system.

INDIANAPOLIS, IND.—The Council is considering the installation of an electric lighting system on Minnesota Street from Belmont Avenue to Harding Street.

INDIANAPOLIS, IND. — The Indiana Hydro-Electric Power Company, affiliated with the Interstate Public Service Company, Indianapolis, has awarded a contract to the Mansfield Engineering Company for the construction of a dam and power-house foundation on the Tippecanoe River, near Monticello, to cost $500,000, exclusive of power plant and machinery. The plant will be the first of a series of hydro-electric

stations in this section and will cost about $1,000,000. Harry Reid of the Interstate company is vice-president and general manager.

NAPPANEE, IND.—The Nappanee Utilities Company expects to install a 150-hp. boiler in June. A. J. Ogden is manager.

CHICAGO, ILL. — The Commonwealth Edison Company contemplates extensions and improvements to its system in the Chicago district, to cost about $11,000,000, during the present year.

RACINE, WIS.—The Wisconsin Public Service Company has appropriated $2,000,000 for extensions to its system during the present year.

ALEXANDRIA, MINN. — Specifications are being prepared for the installation of new equipment at the municipal power plant, to cost $30,000, for which bonds have been voted.

JORDAN, MINN.—The Jordan Electric Light & Heating Company is planning to rebuild its lines and may purchase a second-hand 100-kw. to 150-kw., 220-volt direct current generating set, directly connected. S. L. Sly is manager.

LUVERNE, MINN.—Extensions and improvements are contemplated to the municipal electric light plant, including the installation of a water-tube boiler, heater and water weigher and surface condenser of about 400 hp. capacity. N. A. Lee is manager.

CEDAR RAPIDS, IOWA.—The Board of Public Improvements will soon call for bids for ornamental lamps, conduits, rewiring, etc., for the Second Avenue bridge. L. J. Zika is superintendent.

HUMBOLDT, IOWA. — The Northern Iowa Gas & Electric Company has increased its capital from $1,000,000 to $3,000,000, part of the proceeds to be used for extensions and improvements to its system.

MANSON, IOWA.—The Manson Light, Heat & Power Company contemplates the installation of new engines. Frank W. Mack is manager.

OTTUMWA, IOWA.—The Ottumwa Railway & Light Company contemplates extensions and improvements to its system, including the installation of a 3,000-kw. turbine and auxiliaries. G. E. Fahrney is general manager.

CALIFORNIA, MO.—The California Electric Light & Power Company contemplates the erection of 24 miles of electric transmission line. F. T. Porter is president.

CARROLLTON, MO.—The Water, Light & Transit Company is planning to install a 1,500-kw. generating unit and a 500-hp. boiler. H. A. Spradling is manager.

EOLINE, MO.—The Moffet Coal Company, St. Louis, contemplates the installation of electric and other machinery at its properties at Eoline, recently acquired. W. O. Lewis is assistant general manager.

KANSAS CITY, MO.—The Council has passed an ordinance providing for the installation of a street-lighting system in Santa Fe Place and neighboring streets.

NOVINGER, MO.—The erection of 20 miles of 13,000-volt, single-phase transmission line is under consideration by the Merchants' Light & Power Company. J. F. Duncan is manager.

ST. LOUIS, MO.—The North American Edison Company, a subsidiary of the North American Company, has disposed of a bond issue of $14,000,000, part of the proceeds to be used for extensions and improvements. The Union Electric Light & Power Company, a subsidiary, will erect a new power plant at Cahokia, Ill., to cost about $8,000,000. Edwin Gruhl is president.

WOOD LAKE, NEB. — A new street-lighting system will be installed in the business district, to cost about $10,000. Prince & Nixon, Peters Trust Building, Omaha, are consulting engineers.

BUNKER HILL, KAN.—Work will soon begin on the erection of a municipal electric lighting plant, to cost about $25,000. The Weber Electric Power Company, Ellsworth, is engineer.

ELLSWORTH, KAN.—The Weber Electric Power Company has completed its new 2,000-kw. station and is erecting 70 miles of high-tension transmission lines to reach seven more towns. The company will also install another turbine during 1922. Benjamin H. Bearnes is vice-president.

GREAT BEND, KAN.—The Great Bend Water & Light Company is planning to install a 500-hp. oil engine. E. A. Wright is manager.

McCRACKEN, KAN. — Extensions and improvements are contemplated to the municipal electric light plant, including the construction of a new power station and the installation of two additional oil engines having a total capacity of 250 hp. with generators. L. L. Ryan is city manager.

NICKERSON, KAN.—Plans are under consideration to rebuild part of the municipal electric distribution system. Later a line may be erected to supply electricity to the farming district. B. O. Beck is city engineer.

Southern States

ASHBORO, N. C. — The Council has authorized the installation of new equipment in the municipal electric plant.

CONCORD, N. C.—The Midway Lighting & Improvement Company is planning to erect a transmission line through Midway and surrounding territory to furnish electrical service. Electricity will be secured from the substation of the Southern Power Company in Kannapolis. C. C. Stonestreet is president of the Midway company.

DURHAM, N. C.—The Durham Public Service Company will make extensions and improvements in the street-lighting system to cost about $25,000, the cost to be paid by the city.

GREENWOOD, S. C.—The Greenwood Water & Light Company will make extensions and improvements in the street-lighting system, to cost about $20,000.

COLUMBUS, GA.—The Columbus Electric Company plans a merger with the Columbus Gas Light Company and the Columbus Railroad Company, under the name of the Columbus Electric & Power Company, to be capitalized at $10,095,700. Extensions and improvements are contemplated in the electric system.

PABLO BEACH, FLA.—Bonds to the amount of $38,000 have been voted for the erection of an electric transmission line from South Jacksonville to Pablo Beach. C. U. Smith is clerk.

PENSACOLA, FLA.—The Chamber of Commerce contemplates the installation of an electric lighting system at Camp Saufey.

QUINCY, FLA.—The Council contemplates the construction of a new municipal hydro-electric plant, to cost about $80,000. A number of extensions and improvements will be made in the street-lighting system. J. P. Smith is city clerk.

MEMPHIS, TENN.—A number of electric traveling cranes will be installed at the new barge line terminals, to be constructed jointly by the city and the federal government, estimated to cost $500,000.

BIRMINGHAM, ALA. — The Alabama Power Company will build a transmission line from Selma to Marion, to cost about $75,000.

GADSDEN, ALA. — The Gadsden Clay Products Company will build a one-story, steam-operated power plant at its works. Gordon Hood is secretary.

LUMBERTON, MISS. — The board of trustees of the Edward Hines Yellow Pine properties has acquired the local municipal lighting plant. Extensions and improvements will be made. F. W. Pettibone is general manager.

DE QUEEN, ARK.—The De Queen Light & Power Company has been granted permission by the State Railroad Commission to construct and operate a local power plant.

CONVENT, LA.—The board of directors of Jefferson College is planning to rebuild the power plant at the institution, recently destroyed by fire.

HAMMOND, LA.—The Council is considering the installation of a street-lighting system in the business section and in other principal streets.

JEFFERSON, LA.—The Citizens' Light & Power Company has been granted a twenty-five year light and power franchise in Jefferson Parish. A distributing system will be installed.

RAYNE, LA.—Improvements are contemplated to the municipal electric light plant, including the installation of an engine of about 200 hp., with generator and switchboard. E. J. Bertrand is superintendent.

MUSKOGEE, OKLA.—The Muskogee Refining Company South Cherokee Street, will install electric power equipment in connection with the enlargement of its oil refinery, to cost $250,000.

RED ROCK, OKLA.—At a special election citizens have approved bonds for the construction of a transmission line to Ponca City, Okla., for light and power service at Red Rock.

DALLAS, TEX.—The Dallas Power & Light Company has submitted plans to the City Commissioners providing for the construction of an addition to its main central station, to increase the capacity about 15,000 kw., to cost about $1,500,000. C. E. Calder is president.

HOUSTON, TEX.—The Houston Electric Company contemplates an expenditure of $1,200,000 during the next twenty-four months for extensions and improvements to its system. William E. Wood is manager.

Pacific and Mountain States

ABERDEEN, WASH.—Plans are under consideration by the officials of the Gray's Harbor Railway & Light Company for the installation of a hydro-electric plant to develop 5,000 hp. for use in the Gray's Harbor district. E. N. Sanderson, 60 Broadway, New York City, is president.

CHEHALIS, WASH.—The North Coast Power Company contemplates the erection of new power lines, etc., to cost about $6,000.

SEATTLE, WASH.—The Board of Public Works has authorized bids to be asked for 5,000 poles, cable and wire for transmission and telephone service for the municipal power plant, to cost about $45,000.

SEATTLE, WASH.—The Council is considering a project recommended by J. D. Ross, superintendent of lighting, for a connection between the local municipal power plant and that of the city of Tacoma, for interchange of service. The cost is estimated at $150,000.

SPOKANE, WASH.—The Hedlund Box & Lumber Company, 803 North Stone Street, plans the construction of a power plant in connection with a new lumber mill, to cost about $80,000. D. C. Hedlund is president.

CORVALLIS, ORE.—The Mountain States Power Company is planning to erect a new office building and substation on Second Street, to cost about $15,000, this spring.

FAIRFIELD, CAL.—The Board of Trustees contemplates the installation of an ornamental street-lighting system on Texas Street between Washington and Taylor Streets. J. H. Prather is city clerk.

SAN DIEGO, CAL.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until April 19 for the installation of an electric distributing system at the local naval base. (Specification 4610.)

SAN FRANCISCO, CAL. — The Great Western Power Company, 14 Sansom Street, has purchased the property of the Universal Electric & Gas Company. Plans are being made for extensions to the system.

SANTA MONICA, CAL.—The Council has approved plans for an ornamental street-lighting system in Palisades Park.

YOUNTVILLE, CAL.—The State Department of Buildings, Sacramento, will build a power house at the Yountville Veterans' Home, to cost $40,000. George B. McDougall, Sacramento, is state architect.

GLENDIVE, MONT.—Alvin C. Leighton, Miles City, Mont., is organizing a local company to construct and operate a hydro-electric plant on the Yellowstone River, near the Buffalo Rapids, to cost about $150,000.

ARRIBA, COL.—The Council will build a transmission line for city service about 10 miles long. W. B. Rollins & Company, 209 Railway Exchange Building, Kansas City, Mo., are engineers.

BUENA VISTA, COL.—The Buena Vista Electric Light & Power Company contemplates the erection of a 2,300-volt transmission line from its plant through the town, about 2 miles long, the installation of meters and farm line extensions. Charles S. Shryock is owner.

ALBUQUERQUE, N. M.—The Albuquerque Gas & Electric Company will make extensions in its electric system, to cost about $200,000. Arthur Prager is manager.

Canada

LONDON, ONT. — Application will be made by the City Council to the Provincial Legislature for authority to appropriate $140,000 for the construction of a dam across the Thames River at Springbank Park.

WINDSOR, ONT. — The Avon Power Company is contemplating a hydro-electric development at Avon Falls, near Windsor.

YORK TOWNSHIP, ONT.—Plans have been approved by the Township Council for the installation of electric lamps on Willard and Frater Avenues and Westmount Drive by the Hydro-Electric Power Commission.

MONTREAL, QUE.—The Montreal Public Service Corporation, now being consolidated with the Canadian Light & Power Company to be capitalized at $100,000,000, is arranging an appropriation of $40,000,000 to be used during the next twenty-four months for a hydro-electric power plant and system at Carillon, on the Ottawa River.